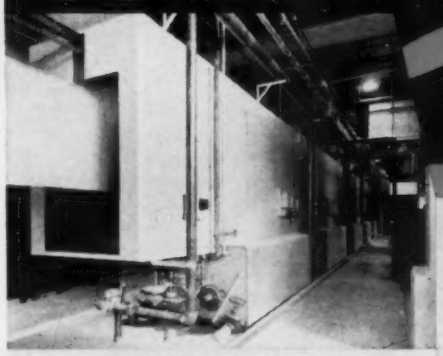
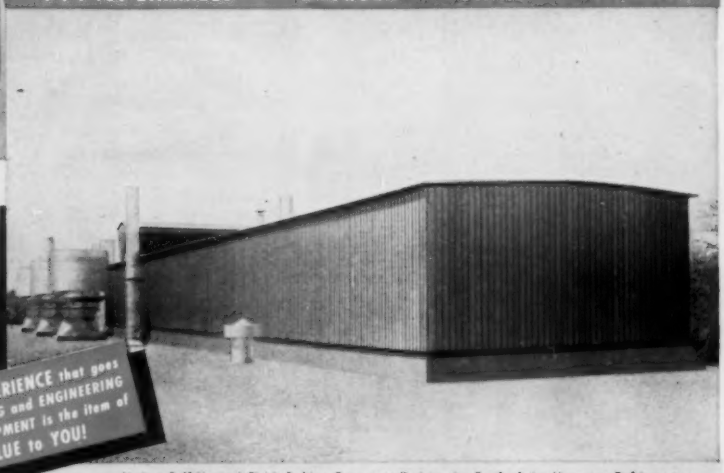
COMPLETE *Finishing* SYSTEMS

. . . for ENAMELS • LACQUER • PAINT • VARNISH

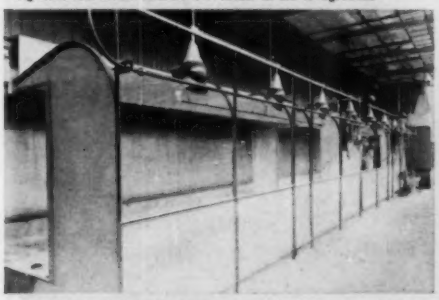


Mahon Five-Stage Metal Cleaning and Rust Proofing Machine—Part of the Complete New Mahon Finishing System at Hussmann.

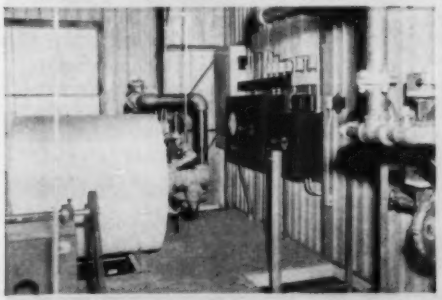
Mahon Dry-Off Oven at Exit End of Cleaning and Rust Proofing Machine. Oven Controls are visible in the foreground.



Mahon Self-Housed Finish Baking Oven installed on the Roof of the Hussmann Refrigerator Co. Plant. Air Intake, Filtered Air Supply Equipment and Heaters are Housed at the far end.



48 Ft. Mahon Hydro-Filter Spray Booth in foreground. Another 24 Ft. Spray Booth for reverse side painting is visible in the background. Note Filtered Air Diffusers in the Ceiling.



Equipment Room between Finish Baking Oven and Air Supply Room. This room houses Heating Equipment and Controls for both Units.

Mahon Installs THIRD COMPLETE FINISHING SYSTEM in Hussmann Refrigerator Plant!

In addition to several smaller projects, the Mahon Company has installed three Complete Finishing Systems for the Hussmann Refrigerator Co., St. Louis, Mo. The latest one, illustrated here, was designed to paint steel shelving. It consists of a five-stage Metal Cleaning and Rust Proofing Machine, a Dry-Off Oven, two Hydro-Filter Spray Booths, an Air Conditioned Spray Room, and a Finish Baking Oven. The Cleaning and Rust Proofing Equipment, Dry-Off Oven and Spray Room are located inside the plant; the Filtered Air Supply Equipment and the Finish Baking Oven are housed on the roof. This is a typical Mahon Finishing System designed to occupy a minimum of floor space inside the plant, and to do a particular finishing job efficiently and economically. Repeat orders from customers over a period of years is an unquestionable expression of confidence in the Mahon organization, and it is an unspoken tribute to Mahon engineering, and to the quality and operating efficiency of Mahon equipment. If you have a finishing problem, or are contemplating new finishing equipment, you, too, will want to discuss methods, equipment requirements and possible production layouts with Mahon engineers . . . you'll find them better qualified to advise you, and better qualified to do the all-important planning, engineering and coordinating of equipment, which is the key to producing the finest finishes at minimum cost. See Sweet's Plant Engineering File for information, or write for Catalog A-658.

THE R. C. MAHON COMPANY • Detroit 34, Michigan

SALES-ENGINEERING OFFICES in DETROIT, NEW YORK and CHICAGO

Engineers and Manufacturers of Complete Finishing Systems—including Metal Cleaning, Pickling, and Rust Proofing Equipment, Hydro-Filter Spray Booths, Dip and Flow Coaters, Filtered Air Supply Systems, Drying and Baking Ovens, Cooling Tunnels, Heat Treating and Quenching Equipment for Aluminum and Magnesium, and other Units of Special Production Equipment.

MAHON

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'ROUND ABOUT

with the editors in field and office

Edited by R. L. Marinello

All Engineers Luncheon

ARE YOU PLANNING to attend the Ninth Plant Maintenance and Engineering Conference, to be held in Chicago from January 27 through the 29th? If so, you will be interested in the All Engineers Luncheon planned for Tuesday afternoon, January 28. The luncheon will be at the Stock Yard Inn, at 1:00 p.m.

Guest speaker for the luncheon will be Dr. Kenneth McFarland, Educational Consultant for General Motors Corp. He is also Educational Consultant for the American Trucking Association. He will present a talk on: "The *Man* in *Man*agement."

More information about this luncheon and an application form for ticket reservations appears on page 137 in this issue.

Engineering-Management Course

SCOPE OF INSTRUCTION in the 1958 Engineering and Management Course is designed to provide offerings in both the traditional and the new areas of industrial engineering and in management theory and practice. Classes will be held at The Los Angeles Campus of the University of California from January 27 through February 6.

Of the 24 subjects to be presented, each participant may select a total of four—one during each of the four daily 1½-hour instructional periods. Some of the subjects which will be included in this year's schedule are: electronic data processing; incentive systems and wage payment; plant layout and material movement; economics of plant investment and equipment replacement; and industrial human relations and labor law.

For further information about this course, address your inquiry to Edward P. Coleman, Coordinator, Engineering and Management Course, College of Engineering, University of California, Los Angeles 24, California.

Standard on Extinguishing Systems

REVISED STANDARD on Carbon Dioxide Extinguishing Systems has just been published by the National Fire Protection Association.

This standard supersedes all previous editions and provides up-to-date installation provisions covering the use of carbon dioxide extinguishing systems for the protection of gaseous and liquid flammable materials, hazardous solids and ordinary combustibles in special enclosures, as well as other types of hazards.

This 64-page pamphlet, identified as NFPA No. 12, is available from the National Fire Protection Association, 60 Batterymarch Street, Boston 10, Massachusetts. The price of the pamphlet is 75 cents.

Gates Named Plant Engineer

John E. Gates has been named plant engineer for Acheson Colloids Company, a division of Acheson Industries, Inc. In his new position, he will be in charge of all plant engineering and maintenance at the Port Huron, Michigan, plant.

Gates, a native of Detroit, served as an oil well field superintendent for William J. Morris at Port Huron for eight years and as an independent oil well contractor for four years before joining the Acheson Colloids Company.

What Is a Good Weld?

RESULTS OF A research project conducted at Ohio State University could eliminate the necessity for much of the inspection now required to locate and measure porosity in welds.

A series of tensile, bend and impact tests were made on butt welds in one-half inch thick mild steel. The welds were made under controlled conditions with automatic submerged arc and inert gas processes so as to create porosity in welds.

These tests showed that the welds could contain porosity amounting in total volume to a void equal to seven per cent of the cross section of the weld without materially changing the tensile or impact strength and ductility of the welds. The tests were all made on welds machined flat from the one-

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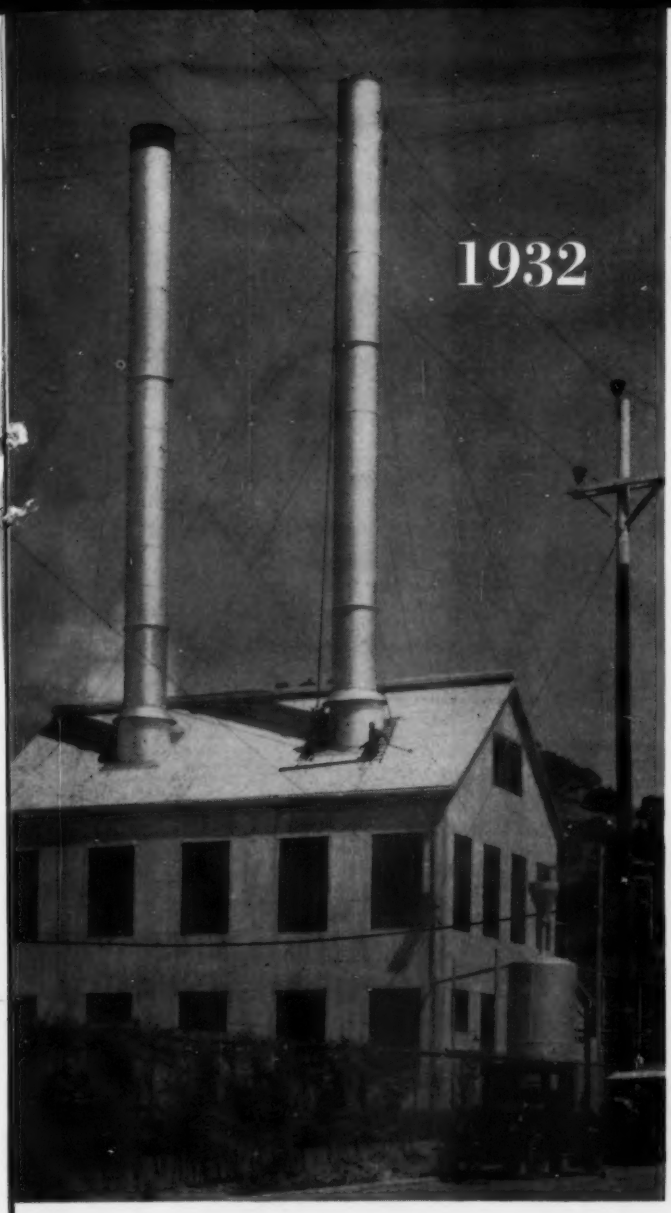

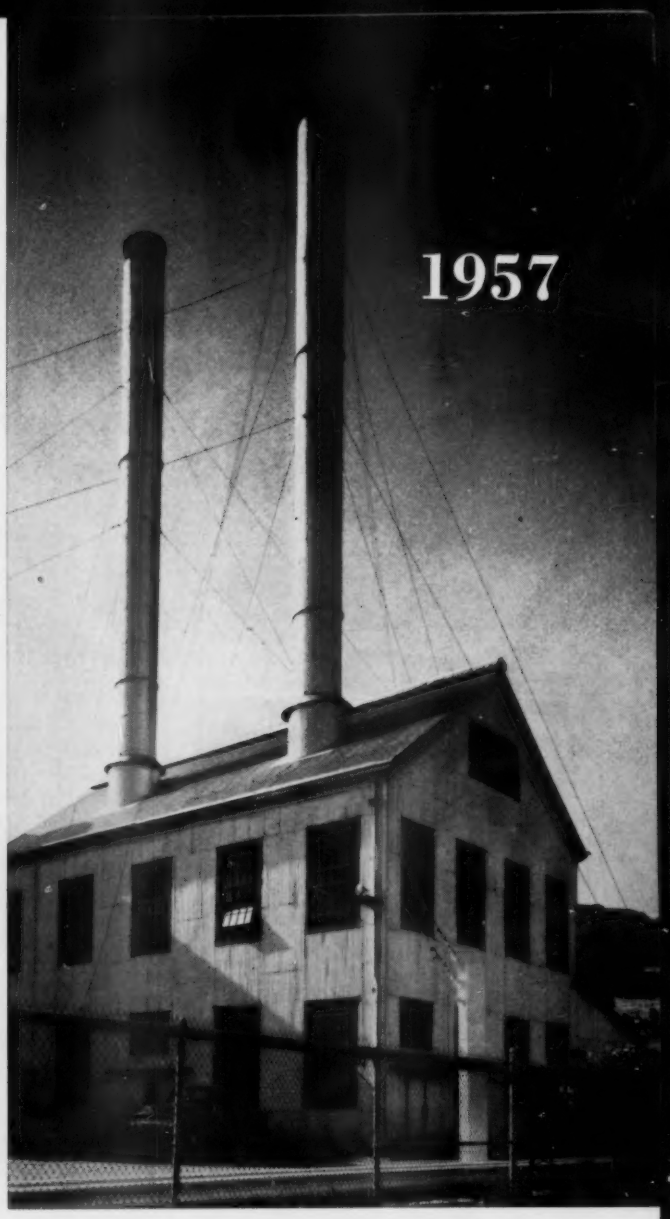

Installed 25 years ago... still in excellent condition... here's another Wrought Iron Plate durability story

After twenty-five years of service over boilers, these wrought iron stacks still rate a "no maintenance needed" inspection report.

These stacks, installed at San Rafael, California, Gas Plant of Pacific Gas & Electric Company, tell the kind of story repeated over and over again whenever wrought iron is used. It's a story of economy made possible because of wrought iron's unique defense against flue gas corrosion.

Byers wrought iron plate is an old campaigner in stack service. You'll find documented evidence of its endurance in our bulletin, *Wrought Iron for Flue Gas Conductors and Coal Handling Equipment.* Clear up a lot of questions about stack maintenance. Write us today for this helpful aid . . . it will pay you.

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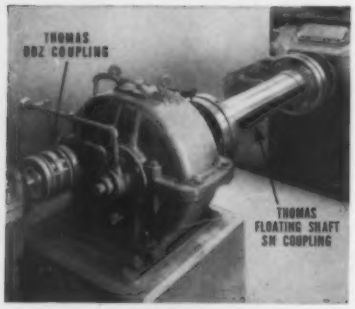
Give You Freedom From Coupling Maintenance



NO LUBRICATION

NO MAINTENANCE

NO WEARING PARTS

Future maintenance costs and shutdowns are eliminated when you install Thomas Flexible Couplings. These all-metal couplings are open for inspection while running.

They will protect your equipment and extend the life of your machines.

Properly installed and operated within rated conditions, Thomas Flexible Couplings should last a lifetime.

UNDER LOAD and MISALIGNMENT ONLY THOMAS FLEXIBLE COUPLINGS OFFER ALL THESE ADVANTAGES.

1 Freedom from Backlash Torsional Rigidity
2 Free End Float
3 Smooth Continuous Drive with Constant Rotational Velocity
4 Visual Inspection While in Operation
5 Original Balance for Life
6 No Lubrication
7 No Wearing Parts
8 No Maintenance

Write for Engineering Catalog 51A

THOMAS FLEXIBLE COUPLING CO.
WARREN, PENNSYLVANIA, U.S.A.

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'ROUND ABOUT

half inch thickness of the plate. Since most welds are made with a build-up that increases the cross section of the weld, the seven per cent figure will actually be larger for welds made with normal procedures. The shape and distribution pattern of the porosity had little or no effect on the test results.

Since the results of the Ohio State University tests show that up to seven per cent reduction of the cross section has little or no effect on weld strength, a re-evaluation of inspection standards is indicated.

For more information about this research project, address your inquiry to Charles G. Herbruck, The Lincoln Electric Co., Cleveland 17, Ohio.

Annual Heating and Air-Conditioning Meeting

SYMPOSIUMS, a Topical Session and papers of timely interest form the substance of the technical sessions planned for the 64th Annual Meeting of the American Society of Heating and Air-Conditioning Engineers. It will be held at the Penn-Sheraton Hotel, Pittsburgh, Pa., from January 27 through the 29th.

Some of the subjects to be presented at these sessions are: the effect of cold ceilings on feeling of comfort; characteristics of multi-louvered dampers; determination of chimney draft; and heat transfer of gravity flow cooling coils.

Additional details of this meeting may be obtained by writing to the American Society of Heating and Air-Conditioning Engineers, 62 Worth St., New York 13, N. Y.

Sanitation Maintenance

BUILDING AND equipment sanitation, the selection of cleaning materials, and the organization and supervision of the cleaning program are becoming increasingly complex. The booklet "Building and Equipment Sanitation Maintenance Principles and Practices," has been published as a guide to planning a plant's housekeeping program.

The booklet discusses the many interdependent factors involved in the overall sanitation picture. Among the topics covered are: the nature of the cleaning problem; types of cleaning materials; fitting the cleaner to the need; selection of cleansers; organizing the cleaning program; and determination of cleaning costs. The booklet also describes programs employed in several industrial plants.

Charts and tables give quick access to such essential data as recommended usage of different cleaning materials on different types of surfaces; time standards for floor maintenance operations and typical work routines in order of performance; a typical facility sanitation rating form; and various ways to assay and reduce time and labor costs involved in sanitation maintenance.

Copies of this booklet are obtainable at seventy-five cents per copy direct from the publishers, the Association of American Soap and Glycerine Producers, Inc., 295 Madison Ave., New York 17, N. Y.

Supervisor of Plant Engineering

William S. Buckley has been appointed supervisor of plant engineering in the Exide Industrial Division of The Electric Storage Battery Company, Philadelphia, Pennsylvania.

He started with the company as a machine designer and was made a field engineer in 1950. In this capacity, he was responsible for the construction of the company's battery plant at Fairfield, Connecticut. He became chief draftsman in the plant engineering department in 1953.

Earlier business associations include nearly two years as factory manager of the Baker Ice Machine Company in Omaha, Nebraska; four years as chief engineer at the R. F. Sedgeley Company in Philadelphia; and three years with General Motors' Ternstedt Division in West Trenton, New Jersey.

Promotions at Maytag

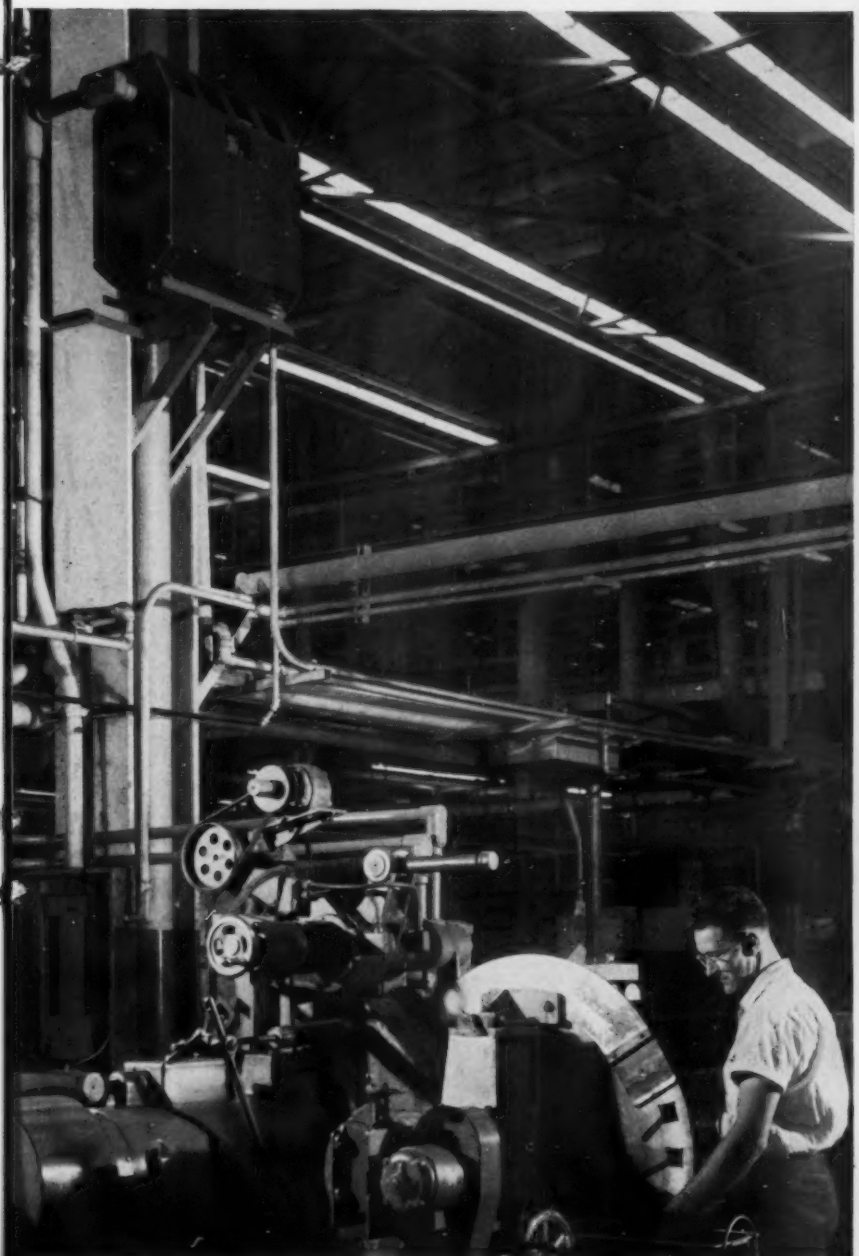
Junior Ekins was recently promoted to general foreman of maintenance at the Plant 2 maintenance department of The Maytag Company, Newton, Iowa. He started work with the company in 1950 as a maintenance millwright. He became a maintenance planner four years later and was named millwright foreman in 1955.

Robert Townsend has been promoted to millwright foreman. He has been employed by Maytag since 1948. He first worked in the grey iron foundry, became a millwright helper in 1949, a millwright trainee in 1952 and a maintenance planner in 1956.

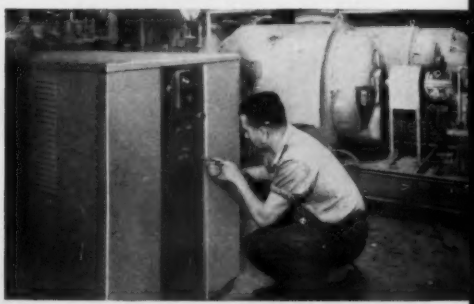
Cecil Ringgenberg has been promoted to millwright planner. He started with the company in 1933. After leaving the company for a period of time, he returned to work in the millwright department in November, 1945.

ECONOMICAL

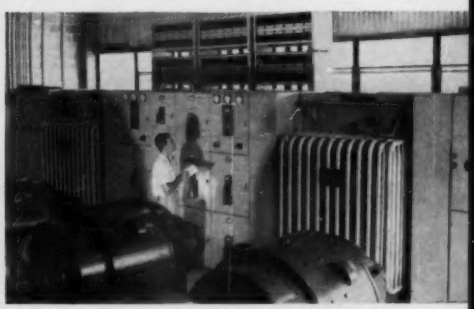
PLAN A COMBINED LIGHT AND POWER SYSTEM FOR SUBSTANTIAL SAVINGS, GREATER ADAPTABILITY



Serving power and lighting loads from one regulated substation offers large savings. Compared with 120Y/208-v systems, G-E 480Y/277-v systems use less-metal circuits. When load areas also need 120- or 240-volt power, economical dry-type transformers can provide it. Result: savings in copper and dollars. Contact your G-E Apparatus Sales Office or send coupon for help in your distribution system planning.



ECONOMICAL Inductrol® voltage regulator provides precise, automatic control of low-voltage loads in power systems at all times.



ECONOMICAL G-E load center system lowers first costs, voltage drop. Capacitor equipments improve power factor, cut costs.

To help make your plant's power distribution system

• ECONOMICAL • EXPANSIBLE • SAFE • RELIABLE • FLEXIBLE

Write to General Electric Co., Section C680-10, Schenectady 5, N. Y. for:

- ☐ "Combined Light and Power Systems," bulletin GET-1337B
- ☐ Information on color movie, "Goodbye Steve," the industrial power story.
- ☐ Inductrol Voltage Regulator, GEC-1450

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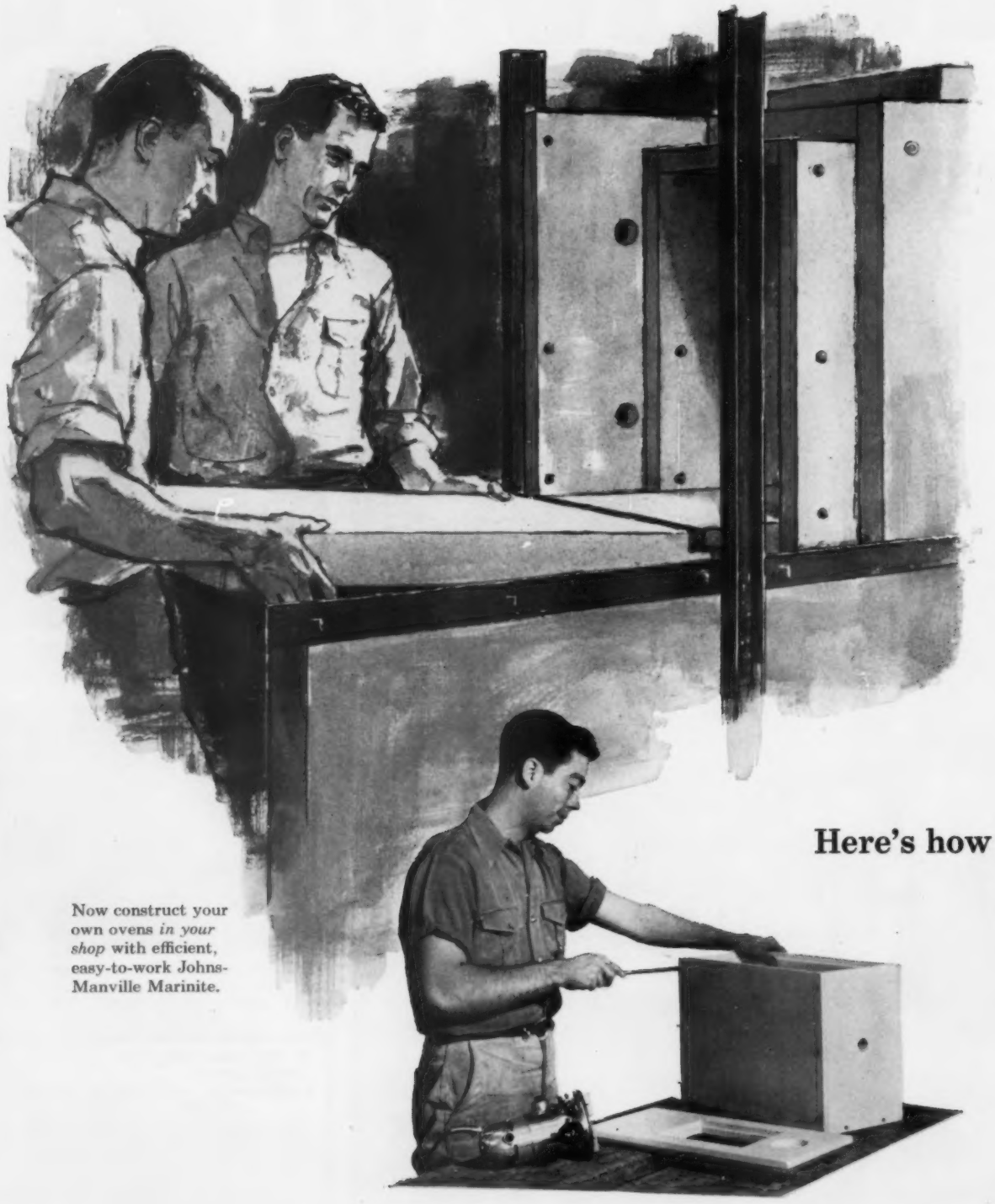


Here's how

Now construct your own ovens *in your shop* with efficient, easy-to-work Johns-Manville Marinite.

fast, new way to oven economy

. . . easy to fabricate . . . easy to maintain . . . builds and insulates in one operation

If downtime and costs are delaying needed oven changeovers—or installation of new ovens—in your plant, here's big news: Johns-Manville Marinite, made of asbestos and diatomaceous silica, can show you the way to build your own high-efficiency oven *in your own shop* at low cost.

Get these important savings

When you build your oven with Marinite, you eliminate the need for linings and outer facings, because Marinite is *both* an efficient insulation *and* a structural board. Your shop can prefabricate oven panels from large 4′ x 12′ sheets with standard saws and drills—assemble them quickly with a minimum of structural support.

Cut maintenance to the minimum

Marinite ovens last indefinitely with little or no maintenance. Made of asbestos fiber, diatomaceous silica and an inorganic binder, Marinite never rusts, rots or corrodes . . . is completely unaffected by moisture condensation during cyclic shutdowns. A rigid, homogeneous material, Marinite eliminates "hot spots" caused by soft insulations that settle and sag in service.

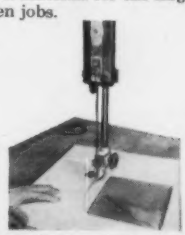
Change over with Marinite now for new oven efficiency

Don't put off your oven changeover another day. With Marinite's low conductivity, you can add new efficiency to your oven at unmatched low cost. And you'll find Marinite cuts heat loss so effectively that areas directly adjacent to ovens become usable, comfortable work areas.

Marinite now carries Underwriters' label

Marinite-23, 36, and 65 now carry Underwriters' Laboratories label for: *zero* flame spread; *negligible* fuel contributed; *zero* smoke developed (based on 100 for untreated red oak). For information write Johns-Manville, Box 14, New York 16, N. Y. In Canada, Port Credit, Ontario.

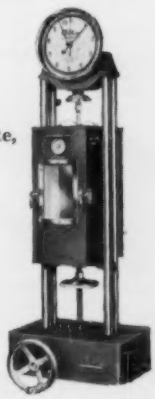
Large Rigid Sheets, up to 4′ x 12′ make Marinite the ideal material for the largest oven jobs.



Workability of Marinite can help you cut oven costs downtime by fabricating and assembling your own ovens.

W. C. Dillon & Co. uses Marinite for easy assembly and close temperature control

W. C. Dillon & Co., Inc., Van Nuys, California, makers of scientific instruments and temperature control cabinets for materials testing, uses Marinite to maintain precise temperature *and* to present a clean, trim appearance. "We would certainly recommend Marinite to any concern interested in *cutting costs and in producing a fine piece of finished equipment,*" says Robert E. Dillon, V. P.



Made of Marinite, Dillon cabinets maintain precise temperatures for materials testing.

JOHNS MANVILLE JM PRODUCTS

JOHNS-MANVILLE
Insulations
FOR LASTING THERMAL EFFICIENCY

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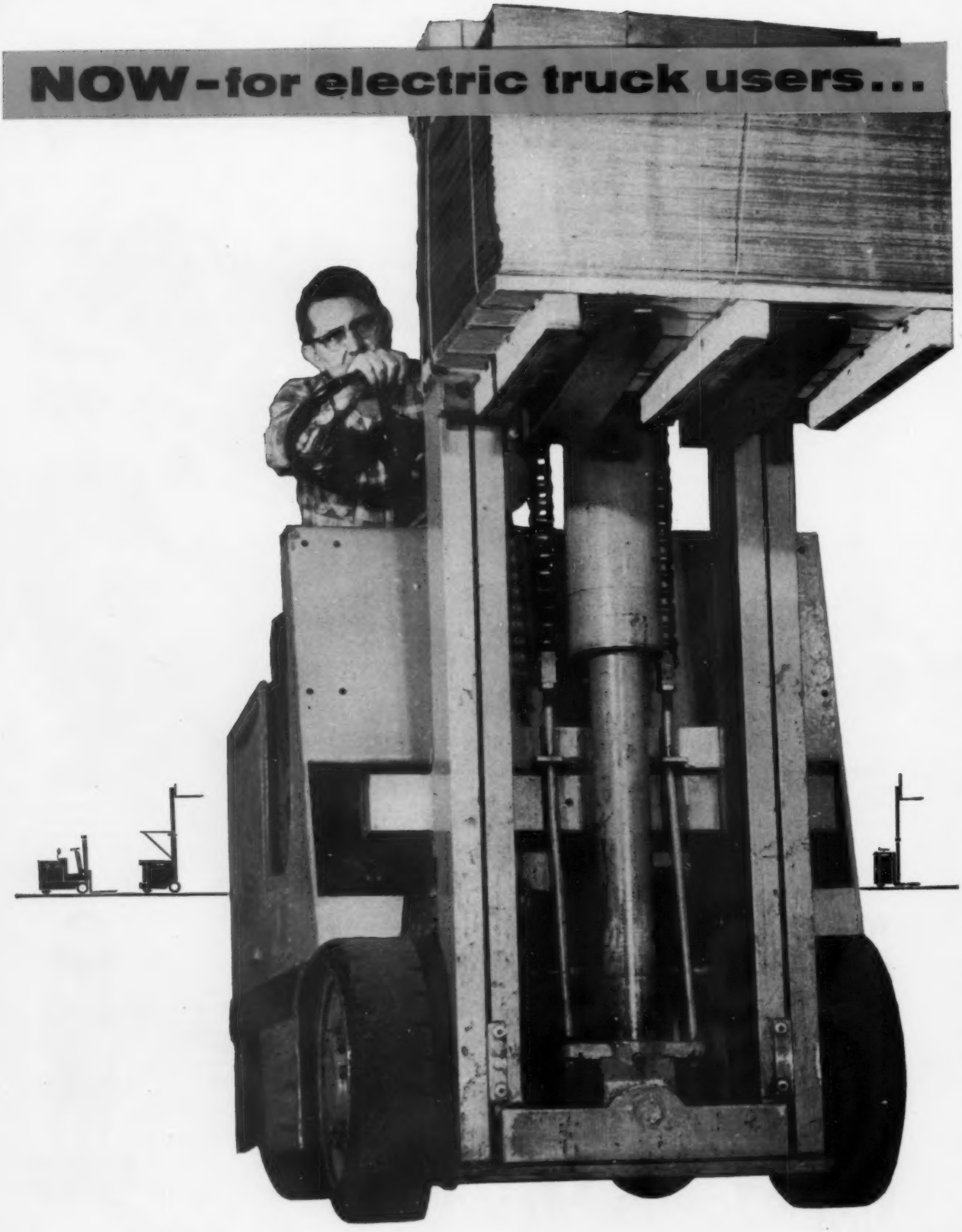
NOW–for electric truck users...



BATTERIES FOR INDUSTRIAL TRUCK • DIESEL STARTING • RAILROAD

2 NEW batteries from C&D!

Get extra life, extra capacity for every make and style truck with C&D *Slyver-Clad*® batteries

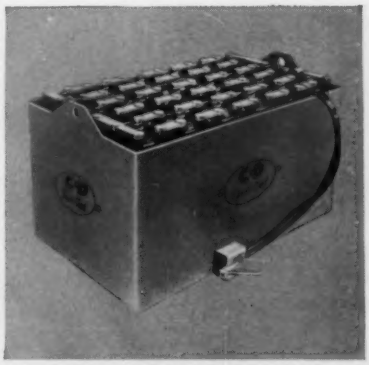
You get extra capacity—yes, and extra life, too—when you use C & D's proven *Slyver-Clad*® batteries!

Electric trucks powered with these remarkable batteries work through the longest shifts and move the most material before recharging—thanks to C & D's Five-Fold *Slyver-Clad* construction. This exclusive method of insulation retains the active materials on the plates, and assures maximum capacity throughout the long, useful life of the battery.

Famous *Slyver-Clad* construction is not new. It is the only time-tested construction proven to be responsible for increasing the capacity available per unit of space, and *simultaneously* increasing the life of batteries over the last decade.

Why be satisfied with less than the best. Specify *Slyver-Clad*—the premium battery for Motive Power Service.

For low silhouette trucks—Type CMS—From 6 cells up—55 A.H. per positive plate—Capacities from 220 to 880 at the 6 hour rate—A new, low battery for the low silhouette trucks—Provides 55 A.H. per positive plate where 40 A.H. has been the standard.



For rider trucks—Type HC—From 6 cells up—Minimum of 72 A.H. per positive plate on delivery—Capacities from 288 to 1152 at the 6 hour rate—Sets a new standard for battery capacity for standard rider type trucks.

The better battery buy is

C&D BATTERIES, INC.

of Conshohocken, Pa.

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Correct Lubrication in Action . . .

$13,388 saved in 6 months

Vulcanized Rubber and Plastics Company has been engaged for 75 years as a leader in precision molding and extrusion of hard and soft rubber—injection molded thermoplastic, and reinforced plastic parts for major industries and, in addition, is one of the world's largest manufacturers of combs.

Mobil **SOCONY MOBIL**

Leader in Lubrication for over 92 years

in the **Rubber and Plastics Molding Industry**

on maintenance, material, man-hours!

How the Vulcanized Rubber and Plastics Company made this substantial saving with the help of Socony Mobil!

In just six months the Vulcanized Rubber and Plastics Company has saved twice the total value of all its oils and greases purchased during the whole year of 1956! Beginning January, 1957, the company protected their Morrisville, Pennsylvania, plant with a Socony Mobil program of Correct Lubrication.

Plant engineer and Mobil lubrication specialists concentrated all their efforts towards improving efficiency of the plant's 42 hydraulic systems. Hydraulic fluids were standardized . . . filtering schedules set up . . . regular maintenance periods established. Periodic Mobil laboratory reports helped check oil quality and efficiency of filtration system.

Savings were swift and sizable. Downtime dropped sharply. Hundreds of repair and maintenance man-hours were eliminated . . . material costs cut. In total, $13,388 saved on the plant's hydraulic systems.

This is Correct Lubrication in Action. The cost-cutting program that devotes Mobil specialists, Mobil facilities, and Mobil's 92 years of lubrication experience to assure utmost protection and full service life from every Mobil product.

SUMMARY OF SAVINGS ACHIEVED THROUGH CORRECT LUBRICATION

* **$1,628 saved on hydraulic oils**—Following Mobil recommendations, plant replaced eight different hydraulic oils with only two Mobil products. This improved dispensing control . . . simplified reclamation . . . cut application time.
* **$2,400 saved on hydraulic system maintenance**—Before Mobil program, maintenance on hydraulic pumps, screens and valves in the injection molding department required two men on full-time basis. Program has proved so effective that equipment today requires only periodic inspection.
* **$100 per month saved on repair parts**—Prior to Mobil program, shafts on Vane-type pumps were snapping due to contaminants wedging into close-tolerance clearances. Cleaner oil and regular application under Mobil program eliminated problem . . . cut repair parts cost $600 in 6 months.
* **$8,760 recovered on press room operation**—Compared to same period in 1956, savings made in Vulcanized Rubber and Plastics Company's Press Room amounted to: $3,960 saved through elimination of downtime. $4,800 cut by reducing maintenance man-hours. Total—$8,760 saved in six months.

Correct Lubrication

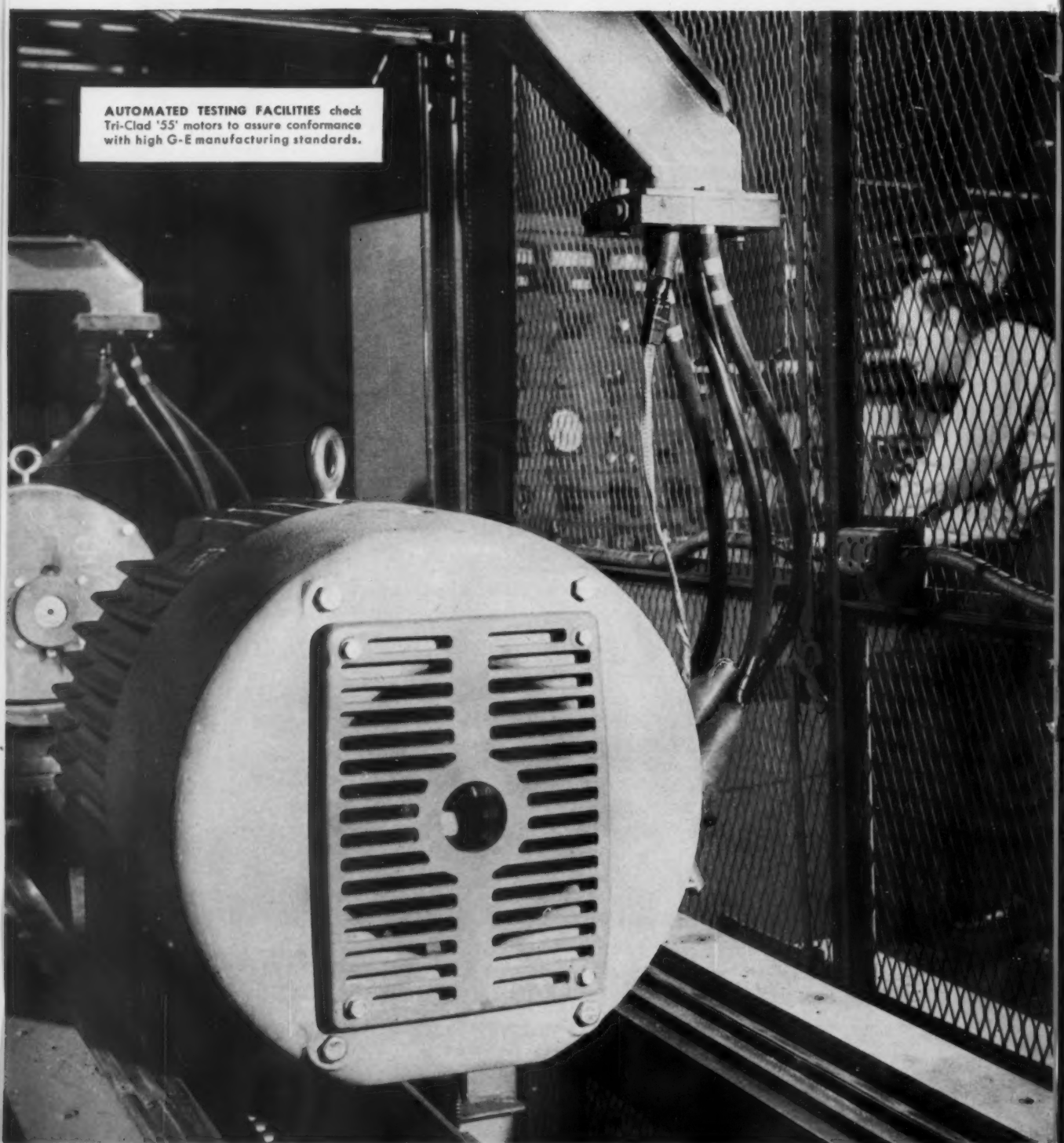
A proved program to reduce manufacturing costs

SOCONY MOBIL OIL COMPANY, INC., and Affiliates: MAGNOLIA PETROLEUM CO., GENERAL PETROLEUM CORP., MOBIL OVERSEAS OIL CO., INC.

For more facts circle 508 on Reply Card

compact . . . power packed

New General Electric
GREATER



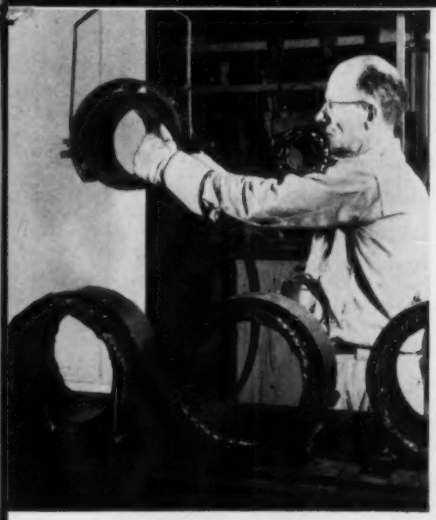
AUTOMATED TESTING FACILITIES check Tri-Clad '55' motors to assure conformance with high G-E manufacturing standards.

TRI 55 CLAD Motors Offer . . .

REG U.S. PAT. OFF.

RELIABILITY

NOW AVAILABLE THROUGH 125-HP



MORE EFFECTIVE INSULATION—New Mylar* polyester film slot and phase insulation gives Tri-Clad '55' stators up to 8 times more protection than conventional types. Formex® wire gives protection against heat aging.

MORE EFFICIENT ROTORS—Revolutionary new double-entrance centrifugal casting technique is utilized on rotors for new larger ratings—up through 125-hp. Solid castings result, helping to prevent localized heating.

MORE FULLY PROTECTED ENCLOSURES—Tri-Clad '55' motor frames and end-shields are cast-iron constructed to provide rigid support and corrosion resistance. Cast-in louvers help protect against contaminant entrance.

immediate shipment . . . all ratings

To cost-conscious motor users, greater equipment reliability means both immediate and long-run cost reductions. In the immediate future, it minimizes profit-robbing downtime and cuts maintenance costs; and, in the long-run, it reduces replacement costs because motors last longer.

Now, to provide increased reliability for motor users, General Electric offers a complete line of Tri-Clad '55' motors—up through 125-hp—designed to new NEMA space and weight-saving dimensions.

QUALITY CONSTRUCTION GIVES GREATER RELIABILITY—New materials and manufacturing techniques—such as those described above—are used in the production of Tri-Clad '55' motors to give added service life, with fewer breakdowns and reduced maintenance.

But, greater reliability is not the whole Tri-Clad '55' motor story. G-E engineers have also designed these new motors to provide easier installation, and reduced shipping, handling and storage costs. And, you can get *immediate* shipment—usually from warehouse stocks—of any popular Tri-Clad '55' motor rating, up through 125-hp.

FOR COMPLETE INFORMATION on the new line of Tri-Clad '55' motors, contact your nearby G-E Apparatus Sales Office or Distributor. Send in the attached coupon for free Tri-Clad '55' motor bulletins.

*Reg. DuPont Co. Trademark

Section A891-9
GENERAL ELECTRIC COMPANY
Schenectady 5, New York

Please send me the following publications:

☐ **FREE BULLETIN (GEA-6602) describes advanced features of new Tri-Clad '55' motors through 125-hp.**
☐ **FREE SLIDE RULE (GEN-148) to determine weight and space-saving benefits of new Tri-Clad '55' motors.**

NAME.....

TITLE.....

COMPANY.....

ADDRESS.....

CITY & STATE.....

Progress Is Our Most Important Product

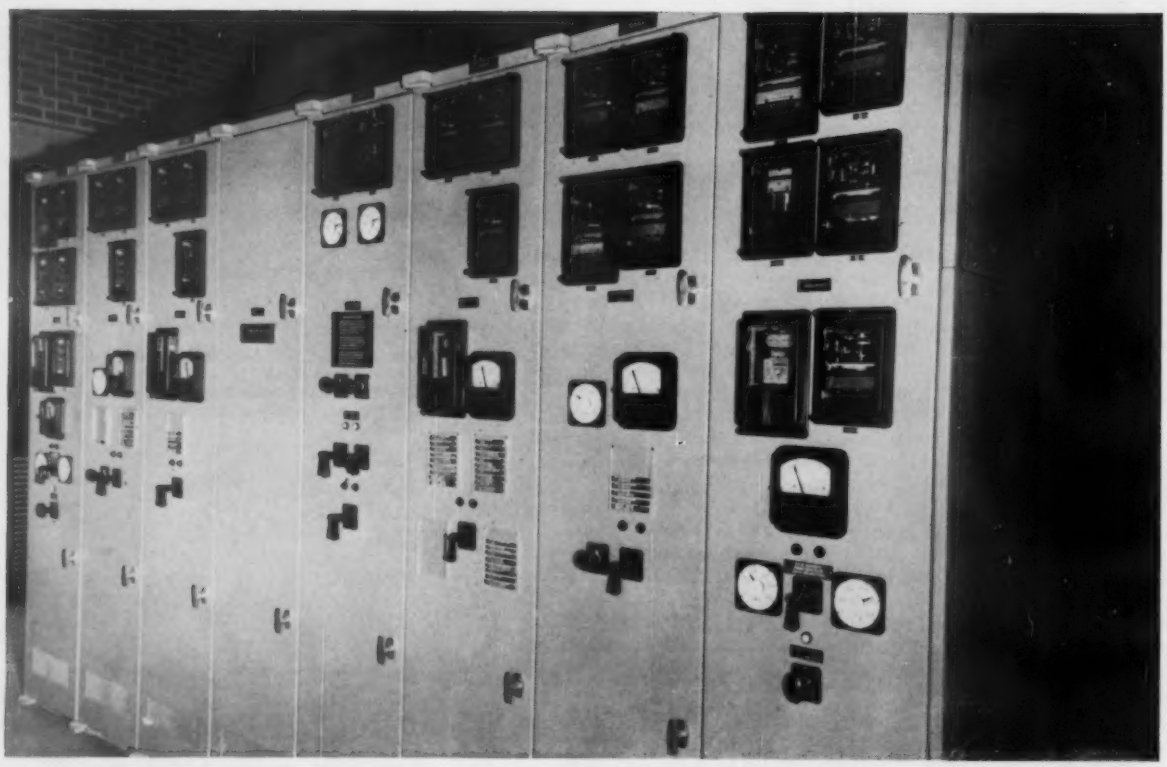
GENERAL ELECTRIC

For more facts circle 509 on Reply Card

First 5 kv Breaker in

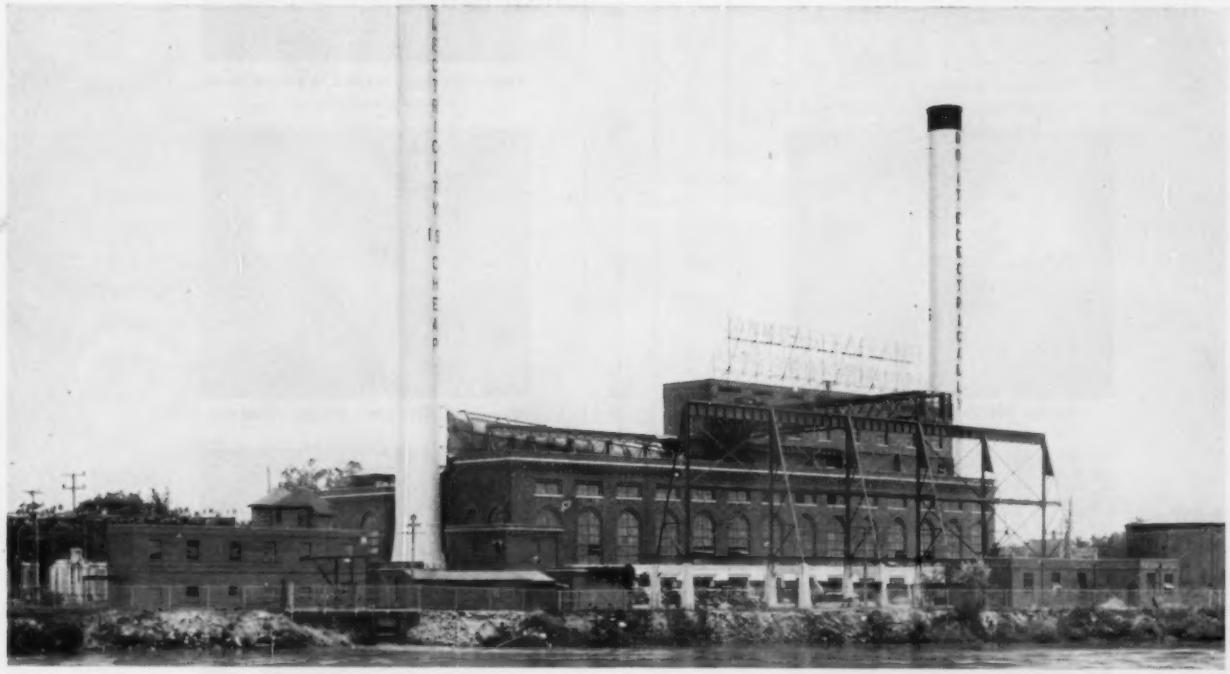
I-T-E leads again. Three installations already. More coming soon.

First 350 mva air magnetic circuit breakers to be developed in the 5 kv class. First to be installed. First to be operating. This latest electrical progress reflects I-T-E's constant effort to extend the ratings of modern metal-clad switchgear. And as with all I-T-E equipment, these new circuit breakers are made with I-T-E's traditional emphasis on sound engineering and quality construction. Available now in 1200 and 3000 amp continuous current ratings. Write for technical details on your specific application.

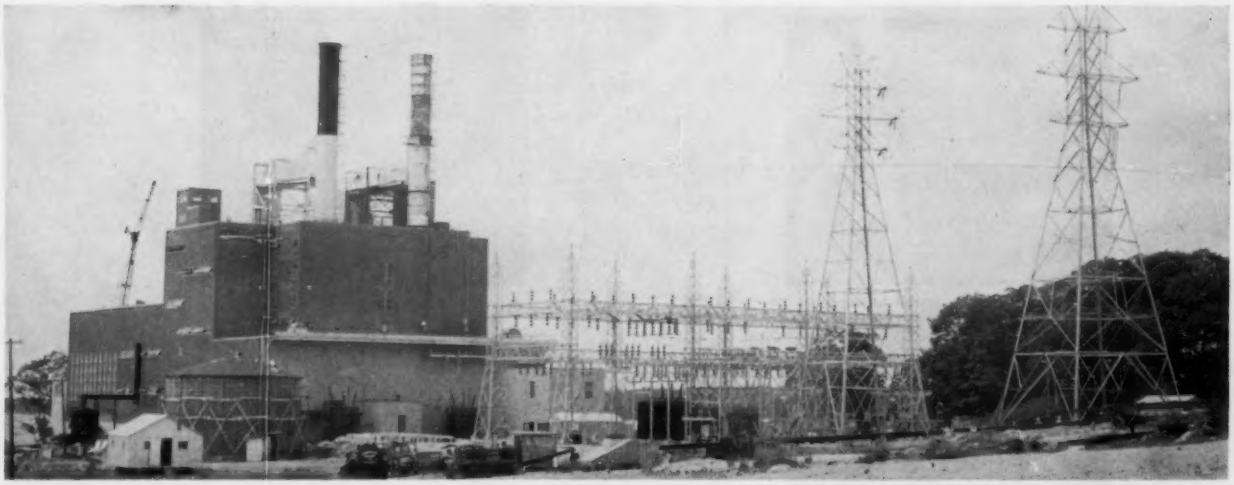


Installation at Esso Standard Oil Co., Baton Rouge, La.

350,000 kva Rating



Kansas Gas and Light Co., Wichita, Kans.



Central Maine Power Co., Augusta, Maine

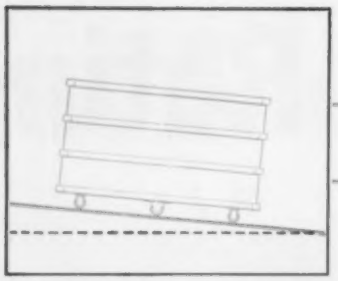
SWITCHGEAR DIVISION

I-T-E CIRCUIT BREAKER COMPANY

19TH AND HAMILTON STREETS, PHILADELPHIA 30, PENNSYLVANIA

For more facts circle 510 on Reply Card

4th
FLOOR
SPINNING
ROOM



Platform *tilts* as elevator doors open when car has been "DISPATCHED" for unloading

Elevator platform tilts for automatic unloading

Truck starts to roll forward

Truck continues to roll forward

Truck picks up momentum on landing incline

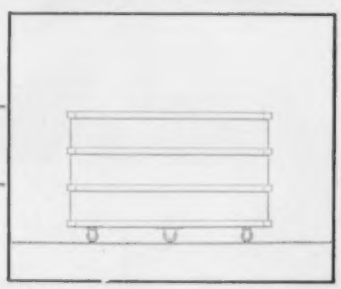
BOBBIN TRANSFER Freight Elevator

Elevator platform is tilted to unload trucks automatically

Elevator is dispatched as soon as loaded

Elevator loading begins immediately

Elevator platform remains level



Platform *stays level* as elevator doors open when car arrives "ON CALL" for loading

1st
FLOOR
WEAVING
ROOM

OTIS ELEVATOR COMPANY • 260 ELEVENTH AVENUE • NEW YORK 1, N.Y.

TILTING PLATFORM

on automatic Otis Freight Elevators saves cost of operators at Bemis

The BEMIS BRO. BAG CO. COTTON MILL, Bemis, Tennessee is a typical cotton mill. It spins on the 4th floor and weaves on the 1st floor. It also has a typical cotton mill problem. Bobbins have to be moved continually between the 4th and 1st floors. The traffic flow is constant but not intensive enough to warrant the expense of freight elevator operators.

BEMIS has a "bobbin" transfer elevator at each end of its mill.

To provide better service and eliminate the cost of six elevator operators, OTIS, working with BEMIS designed an automatic elevator with a tilting platform. Its operation is explained at the left.

Here's the sequence of "bobbin" transfer: When the "doffer", who is the employee that takes the full bobbins off of the spinning frames on the 4th floor, gets a full box he takes it to the elevator and presses the "CALL" button for the 4th floor. If the elevator is already there the hoistway doors and car gates open and he loads the box or boxes into the car. He then closes the power-operated doors and gates by means of the door close button located outside. He next dispatches the car to the 1st floor. When the car arrives the doors and gates open and the platform tilts and rolls the boxes out of the car. Boxes are returned from the 1st floor to the 4th floor in the same manner.

An important working feature is OTIS automatic self-leveling. Elevator and floor platforms must be accurately aligned because of the small wheels on the bobbin trucks. Otherwise the free roll-off would be affected.

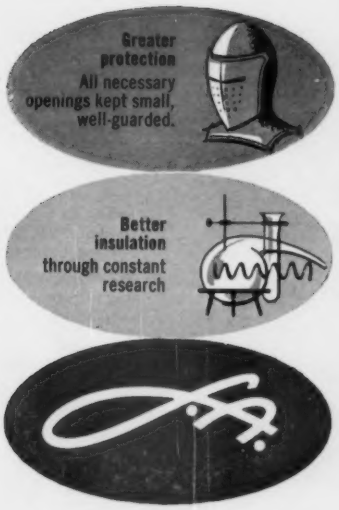
All freight elevators at BEMIS' plants in Bemis, Tenn. and Talladega, Ala. are under OTIS Maintenance. They're kept running at their original efficiency for a fixed monthly charge. There's never an unexpected, expensive repair bill. All replacements of wearing parts are included in the basic OTIS Maintenance Plan.

FREIGHT ELEVATOR
maintenance
that keeps freight elevators running like new

Otis
"ENGINEERED SERVICE BY THE MAKER"

OFFICES IN 297 CITIES ACROSS THE UNITED STATES AND CANADA

For more facts circle 511 on Reply Card



Be glad you weren't working here...

But this sturdy Louis Allis motor was, and still is!

Shortly before this picture was taken, that pulp-mill pump suddenly ruptured. Blasted every object in the area with a thick coating of hot paper pulp.

But note the Louis Allis 20 HP splash-proof motor designed to take this kind of abuse — and come back for more! Note that it took the full force of this blast on its vented *underside* — a motor's most vulnerable point. Only a sturdy, well-designed motor could resist this. Still functioning perfectly this one didn't miss a beat!

Let us tell you more about Louis Allis electric motors. About such unique features as the new varnish of Gilsonite combined with phenolics and alkyds that provides the highest degree of moisture, acid, and alkali resistance . . . locked bearings that reduce end play and extend bearing life . . . the dynamically balanced rotor. And about the many other Louis Allis extras better discussed at length in our file-sized Reference Bulletin 1700. Why not write for it today? The Louis Allis Co., 434 East Stewart Street, Milwaukee 1, Wisconsin.

LOUIS ALLIS

MANUFACTURER OF ELECTRIC MOTORS AND ADJUSTABLE SPEED DRIVES

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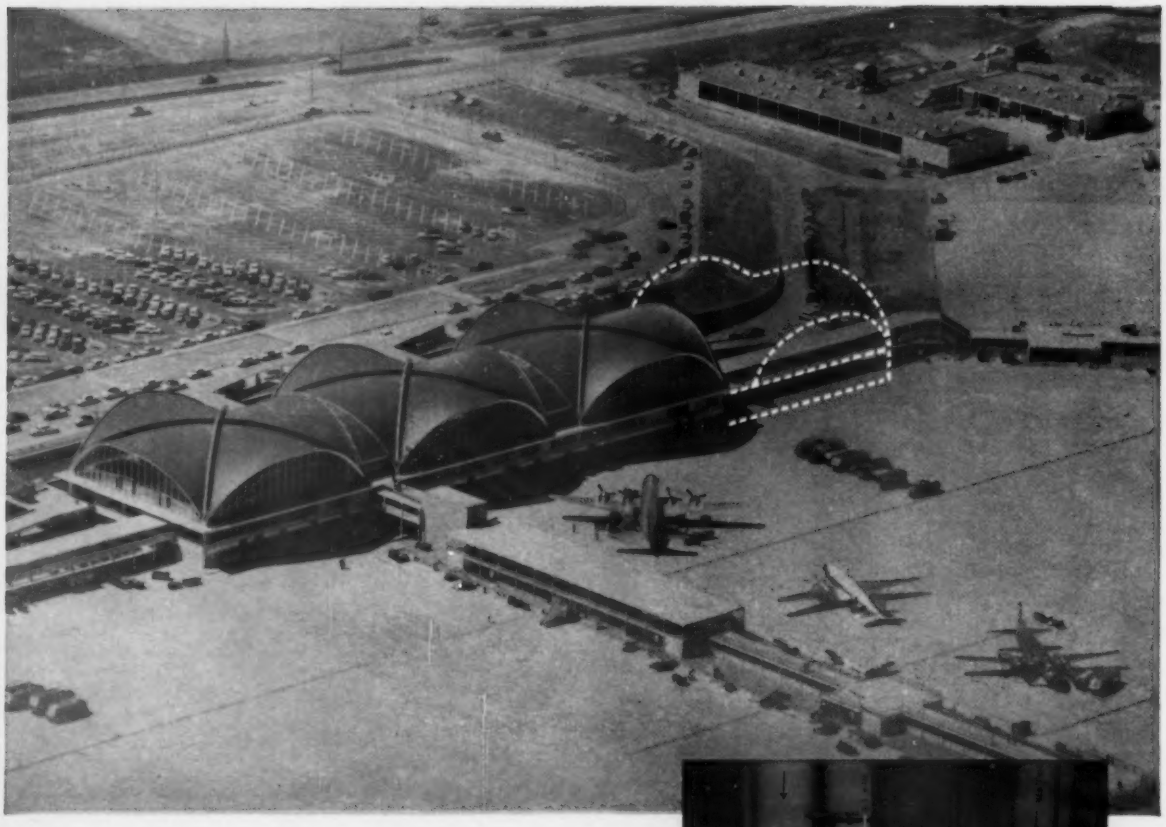

Nalco protects vital services of new LAMBERT-ST. LOUIS AIRPORT

Functional efficiency is usually one of the hallmarks of fine architecture and it is apparent throughout the new St. Louis Municipal Airport Terminal Buildings.

Vital service facilities are housed in a low, clean-lined power plant, well separated from the present main terminal building in anticipation of planned expansion to accommodate increasing airline traffic. The Nalco System protects boiler and cooling water systems by effectively controlling scale, corrosion and microbiological growth . . . a non-architectural supplement to functional efficiency in *any* plant where water is used.

Whether you are planning a new plant, or modernizing an old one, call on Nalco for water treatment chemicals and services that consistently produce outstanding results.

Top photo: Unusual modern architecture of St. Louis Municipal Airport Terminal Building is expandable in any direction. New units (dotted lines), can be added readily when required. Services buildings, *upper right*, are built and equipped with future expansion in mind. *Photo by Lloyd Spainhower.*

Lower photo: Nalco Chemicals and Services protect both boiler and cooling water systems at new St. Louis Airport. In this photo a Nalco cooling water treatment, supplied in ball briquette form, is being applied through the convenient Nalco feeder.

NATIONAL ALUMINATE CORPORATION
6273 West 66th Place • Chicago 38, Illinois
CANADA: Alchem Limited, Burlington, Ontario
NORTHWESTERN UNITED STATES, HAWAII and ALASKA:
The Flox Company, Inc., Minneapolis 3, Minnesota
ITALY: Nalco Italiana, S.p.A.
WEST GERMANY: Deutsche Nalco-Chemie GmbH
SPAIN: Nalco Espanola, S.A.

THE Nalco® SYSTEM . . . *Serving Industry through Practical Applied Science*

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BULLETINS just released and of immediate plant interest

ELECTRICAL

101 Power Packed Motors—Sixteen-pp Bulletin 6602, illustrated in color, introduces company's Tri-Clad 55 line of motors in ratings from 7½ to 125 hp. Text and drawings explain why these compact motors outlast, outperform and are more easily installed and maintained than many motors. Standard, dripproof, TEFC and special models are shown. Full data on sizes given. General Electric Co.

102 D-C Motors, Generators—Form SB-182 describes d-c motors and generators, and their construction features, with cutaway illustrations. Included are dimensions and ratings from ½ to 200 hp on motors and ¾ to 200 kw on generators, with illustrations of applications in typical industries. Marathon Electric Mfg. Corp.

103 Power Transformers—Advantages of company's "Preferred Design" power transformers are described in 40-pp Bulletin GEA-6604. Performance, data, prices, outline drawings, dimensions and weights are given for typical ratings ranging from 5,000 to 50,000 kva, 69 to 138 kv, with or without load tap changing. Photos, drawings and dimensional diagrams illustrate the text. General Electric Co.

104 Open Dry-Type Transformers—Bulletin GEA-6668, 8 pp, describes open dry-type transformers, rated 300 kva and above, 15 kv and below, designed specifically to meet requirements of industrial use. Provides detailed explanation (with schematic diagram) of special silicone-treated core and coil structure, information concerning choice of three types of high-voltage terminations, and charts on weights and dimensions. General Electric Co.

On pages 237-238 are two postage-free Reader Service Cards provided for your convenience in ordering these bulletins. You may also use the cards to order any literature mentioned in ads.

105 Substation Library—Now being reissued is this manufacturer's unit substation technical library. Seven individual publications in the set discuss problems and solutions relating to: distribution substations in system planning (GER-1151); economical size substations of 12-kv distribution system (GER-1299); converting a radial to a primary network distribution system (GER-1313); master unit substations and relay and control arrangements (GET-2528); integrating substation and system planning requirements to reduce over-all investment (GET-2677); use of handbooks for planning purposes (GEZ-1867) and twenty-five years of progress in unit substations (GEZ-1865). The library is available to qualified plant engineers. Please state your job title when requesting it. General Electric Co.

106 Distribution System—Catalog 10, 24 pp, describes Uni-Bus plug-in, "shelf-engineered," power distribution systems for three- and four-wire, 600-v service. Explains how "shelf-engineered" components simplify design and installation. Includes complete specifications, as well as photos, dimensional diagrams, layout procedures, and voltage-drop curves. Electric Distribution Products, Inc.

107 Control Panel—Bulletin GEA-6331A, 12 pp, discusses applications, engineering features, simplified maintenance procedures, and components of 30-in.-deep, front-connected Limitamp control panel. Table of weights and line drawings showing dimensions of starter are included. General Electric Co.

108 Rugged Master Switch—Bulletin GEA-6706, 8 pp, provides detailed information on surface-mounted and desk-mounted heavy-duty master switches. Features, modifications, and operating advantages are discussed, and line drawings illustrating configurations and dimensions of various units are included. General Electric Co.

109 Synchronous Motor Controls—Bulletin GEA-5873B, 8 pp, discusses features and applications of synchronous motor control; describes operation; and provides illustrated examples of how company's starters give step-by-step control of synchronous motors. General Electric Co.

110 High-Voltage Starters—Design features in company's front access, high voltage starters (Type H) for 2300 to 5000-v motors which afford maximum accessibility, protection, performance and space economy are given in 8-pp Bulletin 14 B8507. A cutaway view pin-points important features. Allis-Chalmers Mfg. Co.

111 High-Frequency Capacitors—Bulletin GEC-1346B, 6 pp, describes company's Class HF water cooled high-frequency capacitors and discusses power factor improvements in circuits operating at frequencies from 500 to 12,000 cycles. Performance data, dimensions, drawings and wiring diagrams, charts and pictures are included. General Electric Co.

112 Self-Locking Connectors—Advantages of company's self locking connectors are detailed in this 24-pp catalog. Features are illustrated with photos and drawings, and dimensional diagrams and specifications are included. Avnet Interlock Sales Corp.

113 Electrical Fittings, Fixtures—This hip-pocket size catalog features Alumalloy fittings and fixtures appearing in Condensed Catalog 57 (issued earlier this year). Illustrates styles, lists dimensions, and makes a handy reference. Killark Electric Mfg. Co.

114 Fluorescent Lamp Ballasts—Bulletin GET-922J, 16 pp, contains detailed data on types of fluorescent lamps, starters and ballasts. Complete information is included on installation and operation of ballasts, and equipment needed for direct current operation. General Electric Co.

COMMUNICATION

115 Fire Alarm Systems—This 46-pp catalog contains comprehensive data on all types of fire warning systems. Information covers systems for every type of property—from various types of institutions through office and industrial applications. Among systems covered are selective code systems, general alarm systems, combination fire alarm and paging systems, remote station system. The Autocall Co.

116 Mobile Radio Equipment—Catalog 457, 40 pp, features company's two-way mobile radio antennas, accessories and towers. Profusely illustrated with photos, drawings and diagrams, bulletin includes electrical and mechanical specifications as well as patterns for antennas. Communication Products Co., Inc.

MECHANICAL POWER TRANSMISSION

117 Chains and Sprockets—Catalog 37 contains 30 pp of information on company's conveying and double-pitch power transmission chains and sprockets. Standard chain and attachments are illustrated and charts are used to provide pertinent engineering data for selection. Diamond Chain Co., Inc.

118 High-Speed Belt—This 6-pp bulletin describes a transmission belt designed for speeds to 100,000 rpm and over. Includes detailed technical data, along with graphs showing results of competitive tests as to belt life and elongation. Russell Mfg. Co.

119 Improved Belting—Featured in this 12-pp catalog is a new type of power transmission belting made of polymer and chrome tanned leather, designed for superior strength and elimination of stretching. Sections of catalog cover significant applications, selection of proper belt type, tensioning maintenance. Extremultus, Inc.

120 On Industrial Belting—This catalog contains comprehensive data on company's various brands of inner-locked belting for conveying, elevating and transmission. Designed to aid in solving belt requirements, it features a complete technical data section and is fully illustrated with photos of typical installations. Imperial Belting Co.

121 Variable Speed V-Belts—Replacement Catalog VS-10, 32 pp, is designed to give complete cross-reference information on every variable speed V-belt for every type or make of unit. It also contains an alphabetical listing including drive data and part numbers. The Dayton Rubber Co.

BULLETINS

(Begins on page 21)

122 V-Belt Drives — Bulletin A661 is a 108-pp, comprehensive manual packed with information on selection and operation of V-belt drives. It is arranged in sections covering standard, variable speed and special drives, Taper-Lock sheaves, sealed-life, V-belts, and Taper-Lock bushings and hubs. Engineering drawings and exploded views illustrate technical sections, which contain tables of pre-engineered drives, horsepower capacities, belt speeds, center distances, sheave diameters. Book is available to qualified plant engineers. Please state your job title when requesting it. Dodge Mfg. Corp.

123 Electric Brakes, Clutches—Eight-pp Catalog Digest WEB-6292 describes company's electric brakes, clutches and controls for miniature mechanisms or high torque machine drives. Photos and drawings illustrate construction and operation features. Warner Electric Brake & Clutch Co.

124 Dihederal Spindle Couplings—Catalog 64, 12 pp, covers the development, production and application of company's dihederal spindle couplings for roller drives. Cross-section drawings and dimensional data are given on sizes and types of spindle couplings. Ajax Flexible Coupling Co., Inc.

PACKINGS, SEALS

126 Sheet Packings—Bulletin P-328, 8 pp, gives detailed specifications, engineering, application and testing data on a complete line of industrial sheet packings. The packings covered are fabricated from such materials as asbestos, rubber, synthetic rubber, Neoprene, silicone, fiber and Teflon. Crane Packing Co.

127 Ring Seal—Information on use of the Quad-Ring, a four-lipped seal, is given in this 12-pp booklet. Illustrated with drawings and specification charts, booklet provides design considerations for reciprocal and rotary applications, an engineering check list for packing installation and material requirements and a listing of standard seal sizes. Case histories deal with solution of pressure sealing problems. Minnesota Rubber & Gasket Co.

VALVES, PIPING

128 Gate Valves—Money-saving advantages of King-Clip gate valves are described in Circular 561. Illustrated with cutaway drawings and photos, bulletin gives detailed data, tables of steam and water-oil-gas pressure ratings. Lunkenheimer Co.

129 For Air Operation—Advantages of Flo-Pilot valves for two- or three-way air operation to 150 psi are detailed in 8-pp Catalog 262. Photos and drawings illustrating design features are included, as well as specifications and idea starters for control circuits. Hanna Engineering Works.

130 High-Vacuum Equipment—Valves, baffles and traps designed for high-vacuum applications are featured in 28-pp Bulletin 10-1. Explains design features and methods of operation, and includes selection tables, dimensional data, photos, drawings and diagrams. Consolidated Electrodynamics Corp.

131 Lubricated Plug Valves—Described in 28-pp Reference Book 39, Section 5, are lubricated plug valves featuring stem-sealed self-freeing plug. Features that contribute to longer service are listed and step-by-step directions for lubricating are provided. A wide range of models are shown, along with specifications, and several typical installations are pictured. Homestead Valve Mfg. Co.

132 Ductile Iron Valves—Advantages of ductile, or modular, iron valves are detailed in 6-pp Bulletin 572. Describes testing and research conducted in the development of the valves, as well as specifications on the valves and properties of the metal itself. Kennedy Valve Mfg. Co.

133 Sizing Charts—Bulletin J-SC shows how to size company's sliding gate and plate regulator valves. Technical data (applying to all makes of valves) tells how to adjust sizing for variations in pressure, temperature, viscosity, specific gravity, etc. Charts cover steam, liquid and gas service. Jordan Corp.

134 Valve Controls — How contraction or expansion of valve seat caused by decreasing or rising line temperature can be compensated for with company's valve controls is discussed in 6-pp Bulletin 4-57. Features of the valve controls are detailed and dimensional diagrams and ratings included. Philadelphia Gear Works, Inc.

135 On PVC Pipe—Dielectric values, power factor and volume resistivity of company's PVC pipe, along with mechanical and thermal properties, are explained in this 30-pp catalog. Describes general characteristics of PVC pipe, its properties, applications and gives installation use. An 8-pp chart classifies the corrosion resistance ratings of Type I and II PVC, low carbon steel, three classes of stainless, cast iron, aluminum, copper, red brass, lead, Monel and Inconel with 383 chemicals. A. M. Byers Co.

136 Industrial Pipe Uses—The application of ordinary pipe for hundreds of new industrial uses without the necessity of threading, welding or of special tools is presented in this 12-pp booklet. Explains how pipe can be used to save time and money as well as materials in fabricating or assembling a variety of special production fixtures. Tube-Strut Corp.

137 Pipe Coating, Wrapping—Company's facilities for coating and wrapping pipe are described in this 8-pp bulletin. Drawings illustrate various stages in the wrapping process, and a description is given of the Holiday detection test and other controls for assuring that pipe is evenly coated and protected. Southern Pipe Coating Co.

Reader Service Cards for ordering bulletins are on pages 237-238. Be sure to include your name, job title, and company, even if you want bulletins mailed to your home address.

138 Method of Piping — This illustrated bulletin describes a method of joining thin wall steel and aluminum pipe and tubing by means of quick couplings assembled on grooves precision-rolled in the ends of the tubing. Details of the system and applications are covered. Victaulic Co. of America.

FILTRATION

139 Porous Filters—Porous sintered stainless steel filters are described and illustrated in 12-pp Catalog 54-101. Provides characteristics, application data and specifications and includes selector chart with instructions, plus filtration data. The Cuno Engineering Corp.

140 Filter Cloth Selection — Bulletin 10, 8 pp, gives complete technical data on all types of filter cloth, including Nylon, Dacron, Vincel, Orlon, Dynel, Teflon, Saran, cotton, glass, polyethylene and special filter papers. Data covers chemical resistance, corrosion resistance, abrasion resistance and available yarn forms for each type of cloth. The National Filter Media Corp.

141 Filters and Filtration—This 1957 Supplement contains 16 pp of information on characteristics and major applications of company's Millipore filters for the analysis of liquid and gas dispersed particles and microorganisms. Lists physical and chemical characteristics of the filters and describes applications. Complete specifications are included. Millipore Filter Corp.

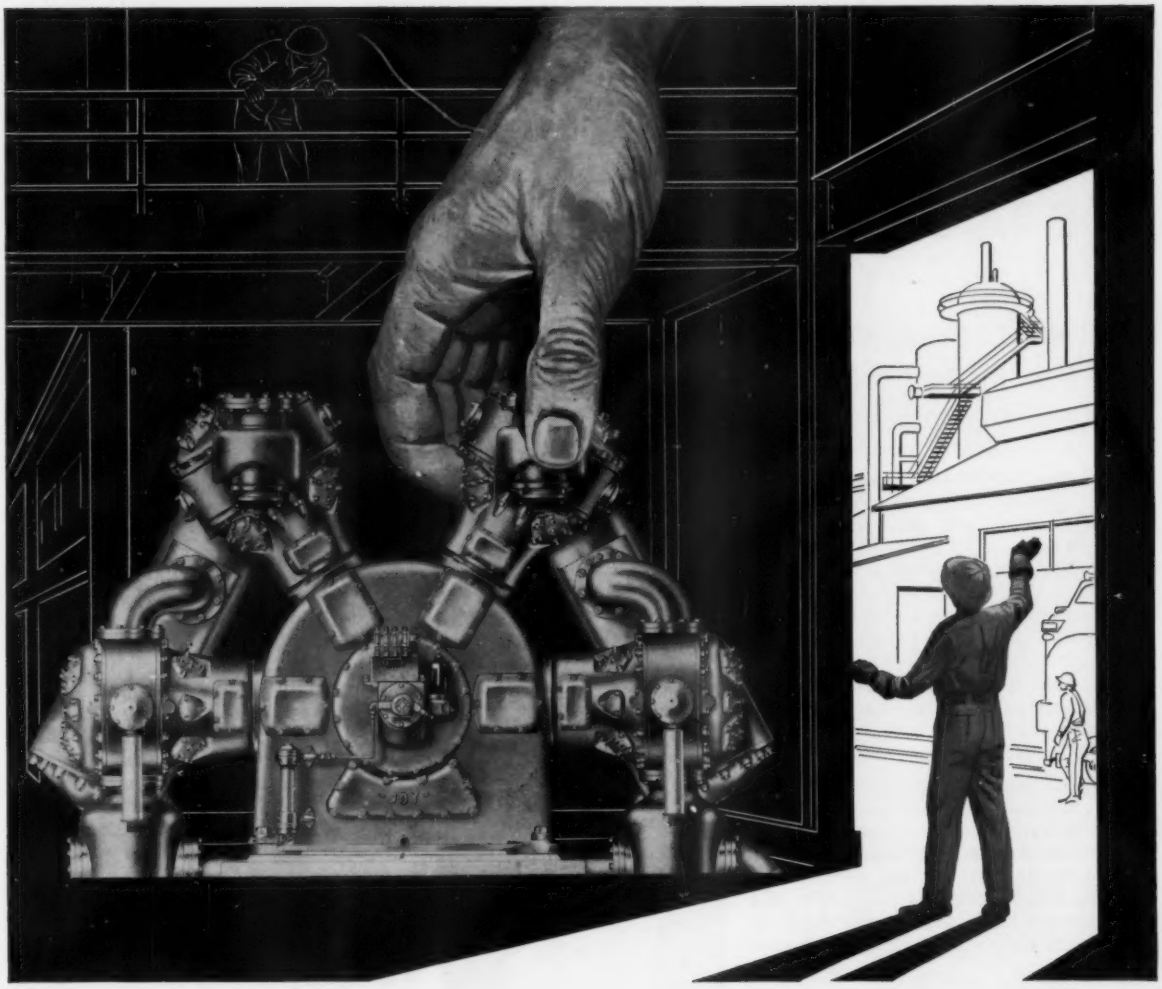
CONSTRUCTION

142 Framing System — This booklet describes a high speed framing system for building repeating pattern structures with company's slotted angle and accessories. Includes photos showing details of construction. Acme Steel Co.

143 Construction Material — Advantages of Gunite—a mixture of cement, sand and water applied under pneumatic pressure—are fully detailed in this 32-pp catalog. Photos of actual construction applications are included. Bolton Gunite Contractors, Inc.

144 Industrial Doors—Catalog A-97, 12 pp, features comprehensive technical data and illustrations on company's industrial doors, including steel frame doors, industrial channel frame doors, galvanized sheet steel covered doors, corrugated sheet metal doors, wood doors, steel plate doors, vertical lift doors and craneway doors. Specification and installation data, application photos and a section on automatic electric door operators included. Richards-Wilcox Mfg. Co.

(More Bulletins on page 236)

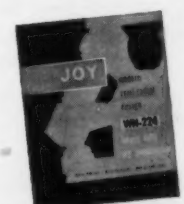


SET A 500 TO 1000 HP AIR COMPRESSOR IN THE CORNER OF YOUR PLANT . . . *almost as easy as this*

IF YOUR EXPANDING PLANT FACILITIES are requiring more compressed air . . . *and* putting a squeeze on plant space, here's the answer . . . the *new* Joy WN-224 compressor. Because of its compact semi-radial design, the WN-224 is delivered as a package—completely assembled—ready to go. Just bolt it down, connect power, water, and air lines . . . and you're ready for long, continuous service. This is the only true "package" compressor available in these capacities . . . 2418 to 6048 cfm . . . horsepower ratings from 350 to 1000.

AND THE WN-224 SOLVES YOUR SPACE PROBLEMS . . . it can be installed where no other compressor of equal capacity will fit. Instead of long, horizontal units on massive foundations, the Joy WN-224 has four cylinders arranged semi-radially around the frame. This compact, balanced arrangement assures smoother running, gives longer service with far less maintenance. Get the whole story on the WN-224 from ***Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa.*** In Canada: *Joy Manufacturing Company (Canada) Limited, Galt, Ontario.*

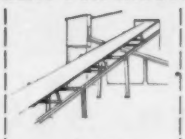
WBW I 6656-179



Write for FREE Bulletin 179-15

JOY . . . EQUIPMENT FOR INDUSTRIAL PLANTS . . . FOR ALL INDUSTRY

Industrial Compressors


Conveyors

Electrical Connectors

Fans and Blowers

For more facts circle 514 on Reply Card

HOW Westinghouse

JOB-TAILORED FLUORESCENT LAMPS MEET YOUR LIGHTING NEEDS

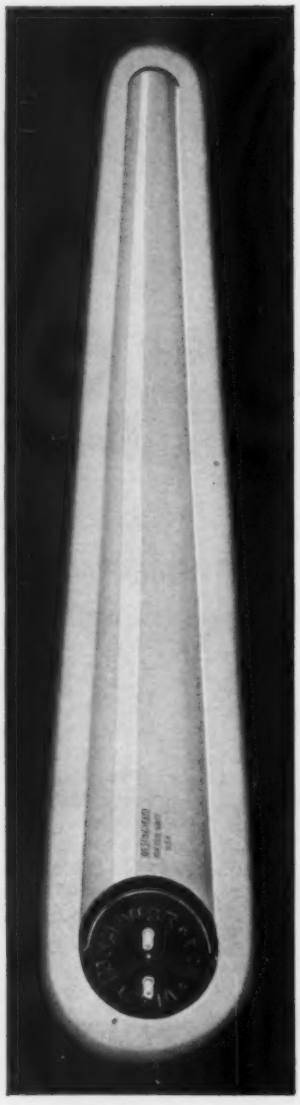
...all with ULTRALUME™ High-Intensity Phosphors • MORE LUMENS PER WATT... more light for your dollar • UNIFORM END-TO END LIGHT • PERFECT COLOR MATCH...ALWAYS • MAXIMUM OUTPUT MAINTAINED THROUGHOUT LONG LIFE

1. New SUPER-HI Fluorescent lamps produce more than twice the light per foot. Designed primarily for high bay (20 feet or higher) industrial and outdoor lighting, a new line of extra high light output fluorescent lamps produce more than twice as much light output per foot as standard fluorescent lamps. The new SUPER-HI lamps permit extremely high energy loading of electrodes, the arc stream and the phosphor. This gives you high light output with new economy at good efficiency and long life.

SUPER-HI lamps are light in weight, convenient to handle and provide a light source subject to the same easy optical control as with present standard T12 lamps, but with over twice the light output. Available in 105, 155, and 205 watts, 4, 6 and 8 ft. The lamps have a rated average useful life of 5000 hours, deliver 6000 to 13,000 initial lumens.

2. High Output Rapid Start lamps give more than 50% more light than regular type. Designed primarily for medium-high bay (15 to 20 feet) industrial and outdoor lighting, four new sizes of Westinghouse high output, rapid start fluorescent lamps can produce over 50% more light than comparable sizes of regular lamps and offer new economy and effectiveness to fluorescent lighting. These lamps provide increased lighting levels, make installations with adequate footcandle values of deluxe color light more practical, and improve the economy and practicability of fluorescent lighting at higher mountings and at lower ambient temperatures.

These lamps are available in 24", 48", 72" and 96" T12 design for general indoor use and for outdoor service where retention of light output at low temperatures is essential. The 72" T12 is recommended for street lighting.



3. Reflector-Fluorescent lamps produce 60% more directed light. For use where external reflectors are difficult or impractical to use, or where dirt deposit cuts lighting effectiveness, these Westinghouse Reflector-Fluorescent lamps provide a directional light distribution which helps put the light where you want it. This is accomplished by a built-in reflecting surface, extending the length of the lamp on the inside of the tube, which redirects about 60% extra light out the other side. Westinghouse Reflector-Fluorescent lamps are recommended for use in coves, showcases and other locations where space is limited. Indirect lighting effects may also be obtained by aiming the lamps toward the ceiling.

They also solve special lighting problems including temporary lighting for construction projects, displays, and exhibits.

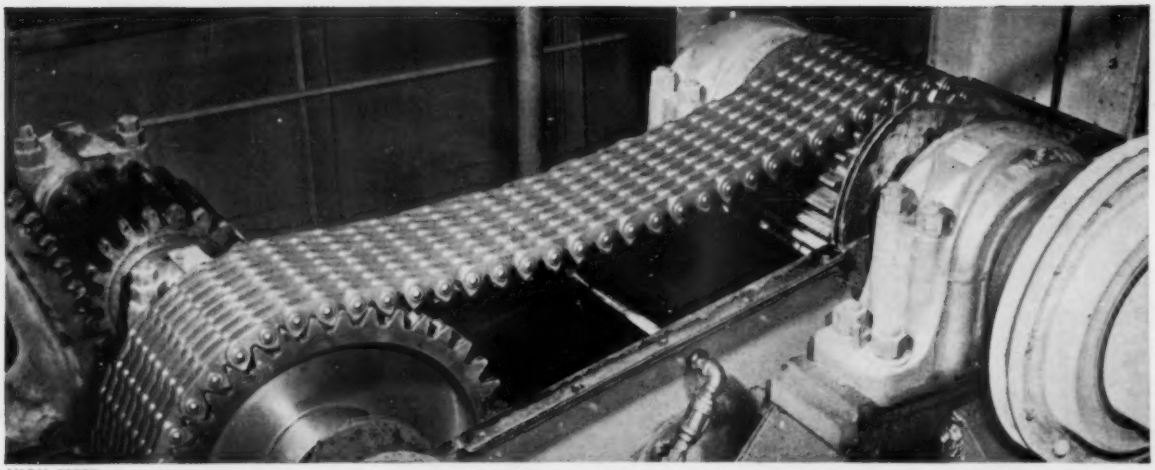
Westinghouse Reflector-Fluorescent lamps are available in 40 watt rapid start, 48" and 96" T12 slimline types.

4. Beauty Tone™ Home-line Fluorescent lamps with warm white deluxe color. The same new Westinghouse "Beauty Tone Home-line" lamps which are revolutionizing home lighting by providing warm white deluxe illumination are also ideal for offices, stores and wherever "friendly" color of light is wanted to flatter complexion, enhance the natural color of furnishings, decorations, and displays, and blend well with incandescent lighting.

There's a network of Westinghouse distributors ready to serve you. Call your nearest Westinghouse Supplier for a free Job-Tailored Survey of your lighting requirements. Or write Westinghouse Lamp Division, Bloomfield, N. J.

YOU CAN BE SURE...IF IT'S Westinghouse

For more facts circle 515 on Reply Card



HIGH SPEED. Traveling at speeds as high as 5000 fpm, silent chain drives readily accommodate the extreme peak loads without losing their better-than-98% efficiency.

How LINK-BELT silent chain drives survive industry's roughest requirements

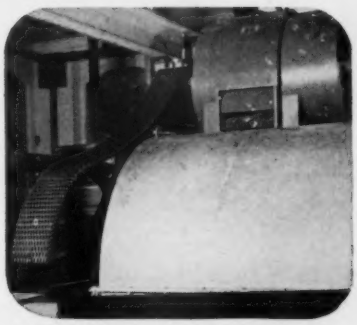
Would your drives do as well?

On applications like these and scores more, no other type of drive is the equal of Link-Belt silent chain. Ask your Link-Belt office or authorized stock-carrying distributor for comprehensive 88-page Book 2425.

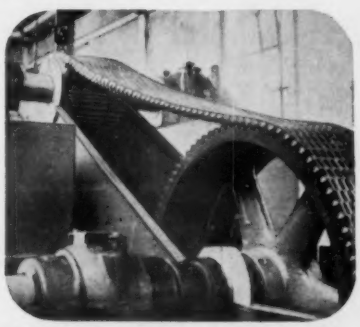
LINK-BELT

SILVERSTREAK SILENT CHAIN DRIVES

LINK-BELT COMPANY: Executive Offices, Prudential Plaza, Chicago 1. To Serve Industry There Are Link-Belt Plants, Sales Offices, Stock Carrying Factory Branch Stores and Distributors in All Principal Cities. Export Office: New York 7; Canada, Scarboro (Toronto 13); Australia, Marrickville (Sydney), N.S.W.; South Africa, Springs. Representatives Throughout the World. 14,670

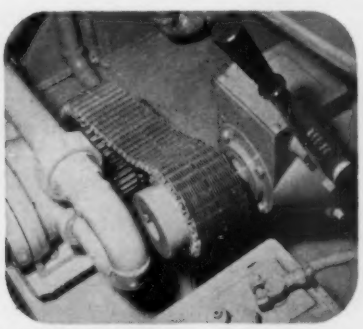


LARGE OR SMALL HP. On a 300 hp drive like this or at fractional hp, silent chain is always lower in ultimate cost.

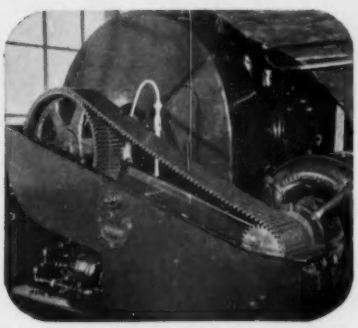


LARGE RATIOS. Link-Belt silent chain operates efficiently on extremely short centers at ratios as high as 10-to-1.

ADVERSE OPERATING CONDITIONS. Heat, humidity and cold have little effect on Link-Belt silent chain drive performance.



LIMITED SPACE. Easy to assemble in close quarters, Link-Belt silent chain permits built-in drives, compact housings.



LONG LIFE. This drive is 16 years old and still going strong. Not unusual—many others have lasted twice that long.

For more facts circle 516 on Reply Card

Automobile plant modernizes electrical distribution system

Motor car manufacturer uses General Electric interlocked armor cable system to provide low-cost electrical availability.

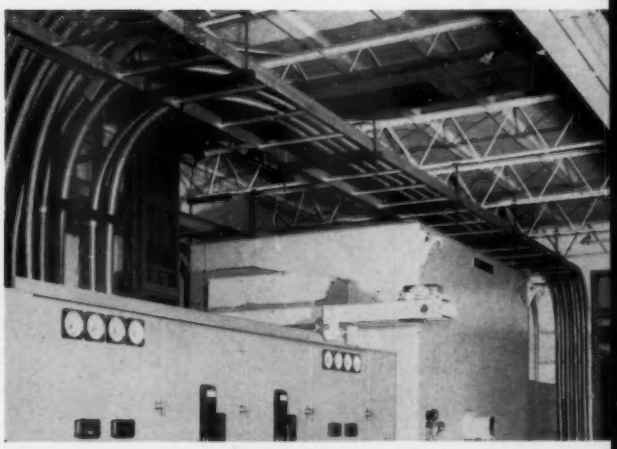
Manufacturers who are looking ahead appreciate the importance of expert engineering, and demand this quality in all their plant equipment. That's why engineers at a well-known automobile plant recently specified a General Electric interlocked armor cable system when modernizing the plant's electrical distribution system. With it, they can meet growing electrical needs, add new feeders, serve new areas—without major conversions.

Fast, simple installation earned the engineers' special approval. General Electric Type SI-13222 cable went in easily on neat, easily-handled racks —in spite of the large size (3.75″ O.D.) of the cable. There wasn't a sign of flattening or other damage to the aluminum armor.

General Electric field experience with interlocked armor cable helps to account for the damage-free installation. This experience has enabled G-E engineers to design armor configurations and ridges for better pulling properties along with superior crush and tensile strength, and more efficient locking.

G-E EXPERIENCE in the cable field has also produced other valuable cable features. For example, G-E varnished-cambric cable resists ionization indefinitely because of the polymerization of the varnish. G. E. also developed butyl-insulated interlocked armor cable for wet and dry locations. And G.E. has pioneered the rise of cables with polyvinyl

G-E INTERLOCKED ARMOR CABLE went in easily at this automobile plant in spite of the 850- to 1100-ft runs and an average of eight right-angle bends, both vertical and horizontal, per cable. Cable used is Type SI-13222 three-conductor, 500 MCM 15-kv ungrounded neutral.



INDOORS AS WELL AS OUTDOORS, G-E interlocked armor cable is easily installed, easy to reach, neat in appearance. Note the conventional switchgear terminations, and the minimum number of joints and fittings needed.

chloride coating over the armor, to give superior resistance to corrosion without affecting the cable's flexibility.

Today, General Electric produces interlocked armor cables with varnished cambric, thermoplastic, silicone rubber, and asbestos insulations, and with galvanized steel, aluminum, and bronze armor, with or without PVC coating over the armor.

THE RIGHT BALANCE OF PROPERTIES in interlocked armor cable *plus* skilled, experienced assistance can help you cut installation and maintenance costs while providing for present and future needs. Count on General Electric to supply both the cable and the service. For a free booklet *"G-E Interlocked Armor Cable,"* write to Dept. W205-1264, Wire and Cable Department, General Electric Company, Bridgeport 2, Connecticut.

COMPARATIVE STUDIES of many installations prove G-E interlocked armor cable takes up less space. Installation costs have also proved to be lower than cable in conduit and bus systems. The cable's accessibility greatly reduces maintenance costs.

Progress Is Our Most Important Product

GENERAL ELECTRIC

For more facts circle 517 on Reply Card

Laboratory...

Production Line...

Tool Room...

Finishing Operations...

Wipe better at less cost

KIMWIPES Industrial Wipers save over cloth, eliminate laundry charges, rag collecting, counting and material losses. Soft, disposable Kimwipes save production time. They wipe clean faster, dry or soaked with solvents!

You can often reuse a Kimwipe, too. When the job calls for a clean wiper, reach for a fresh Kimwipe—dispensed pop-up fashion just like Kleenex tissues! For your convenience . . . in pop-up dispensing cartons or metal wall dispensers.

Kimwipes are made by the makers of Kleenex® tissues

Machine Maintenance...

Inspection Department...

Print Shop...

General Plant Use...

use **Kimwipes*** INDUSTRIAL WIPERS

Kimberly-Clark Corporation Neenah, Wisconsin

*T. M. Reg. U. S. Pat. Off.

For more facts circle 518 on Reply Card

Always, at SKF, you will receive unbiased advice

because

– All four basic types of anti-friction bearings are available from **SKF**.

because

– They offer an extraordinarily wide range of sizes and combinations to meet virtually any requirement.

because

– Their long experience in the widest variety of bearing applications is your assurance of receiving sound recommendations.

because

– Thousands of manufacturers have been using the **SKF** Bearing Advisory Service for many years – always with good results. This dependable service is available to you, too. 7754

SKF

EVERY TYPE—EVERY USE

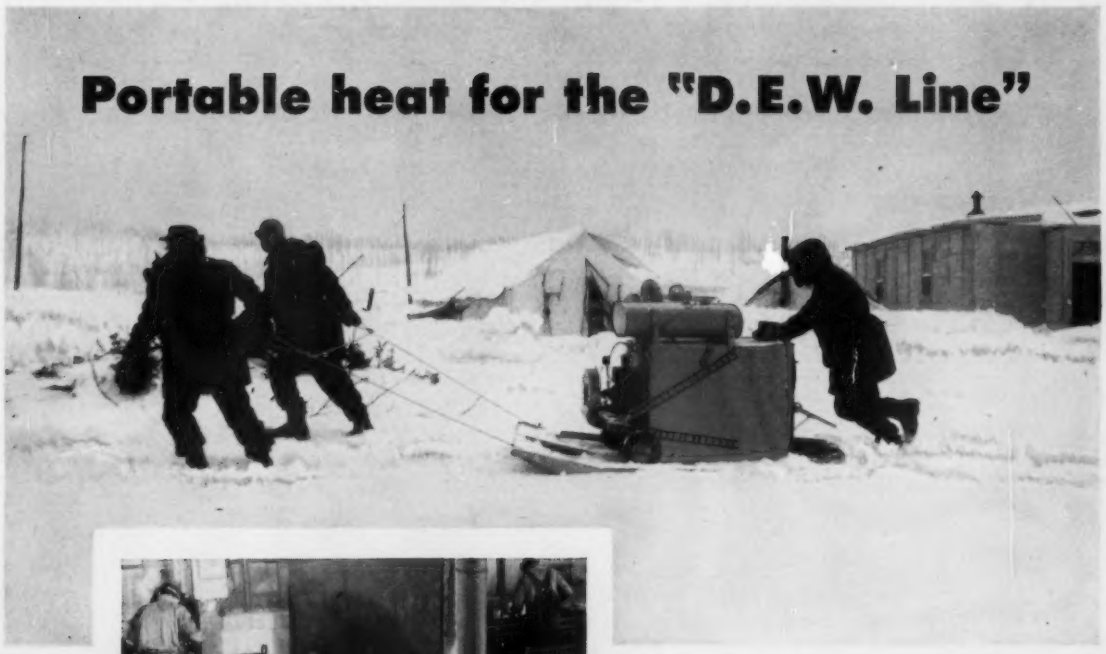
- *Ball Bearings*
- *Cylindrical Roller Bearings*
- *Spherical Roller Bearings*
- *Tapered Roller Bearings ("Tyson")*

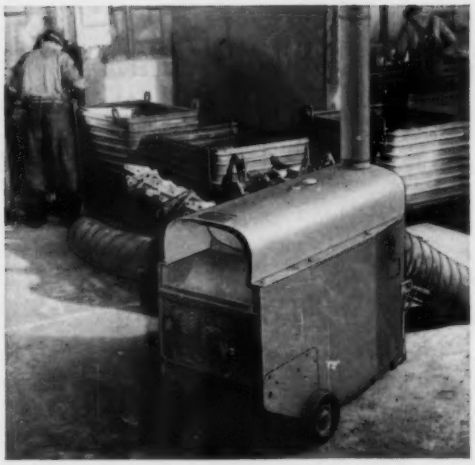
* Reg. U.S. Pat. Off.

SKF INDUSTRIES, INC., PHILADELPHIA 32, PA.

For more facts circle 519 on Reply Card

Portable heat for the "D.E.W. Line"





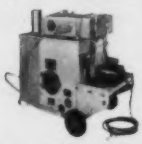
. . . or temporary heat in a machine shop

count on . . .

HERMAN NELSON PORTABLE AIR HEATERS

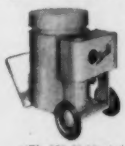
everybody else does!

Only the *best* in portable heaters will do for the "D.E.W. Line"—and they're Herman Nelson! For *your* winter jobs in road-building or home-building—plant maintenance, plumbing or plastering—get your portable heat from a Herman Nelson. No other portable heater gives you such safety and dependability . . . engineered for long service with minimum repairs. Many contractors and builders find Herman Nelson Portable Heaters pay for themselves the first winter. You can buy or rent a Herman Nelson for any job need. See your dealer now!



"Utility" Model
Interchangeable power plants — gasoline engine or electric motor. Gasoline or oil fired. Up to 425,000 BTU capacity.

"De Luxe" Model
Oil Fired. Electric motor powered. Up to 450,000 BTU capacity. The finest of all portable heaters—completely automatic.



"Thrifty" Model
Oil Fired. Electric motor powered. Easily portable, light weight, only 24" wide. Up to 165,000 BTU capacity. Low price!

Get free weather forecast service, mail coupon

AMERICAN AIR FILTER COMPANY, INC.
Portable Products Dept. 231 • Louisville 8, Kentucky

Rush me complete literature on portable heaters. Also send your monthly Weather Forecast Chart, at no cost or obligation to me.

NAME_____

COMPANY_____

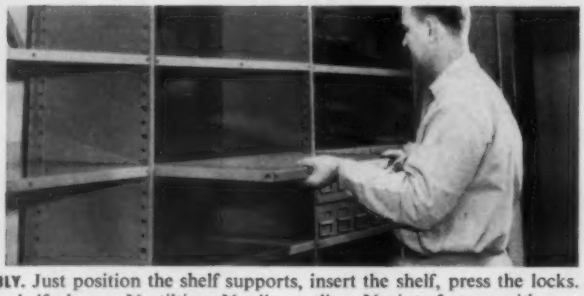
ADDRESS_____

CITY_____ ZONE____ STATE_____

For more facts circle 520 on Reply Card

Only New HALLOWELL *ERECTOMATIC.* Steel Shelving

has a time-saving, positive built-in lock—plus these features:



FAST ASSEMBLY. Just position the shelf supports, insert the shelf, press the locks. Straight-in, straight-out shelf change. No tilting. No dismantling. No interference with any other shelf.

New Hallowell ERECTOMATIC® steel shelving goes up fast, can be rearranged in seconds. It's the unique built-in locking device* that cuts assembly time, speeds repositioning of shelves. Here's how easy it is! To position a shelf—slide it into place on the shelf supports, press the locks, and the job is done. To reposition a shelf—release the locks, pull the shelf straight out, slide it straight in on the supports at its new location, and press the locks. It takes only seconds to complete the move.

New Hallowell ERECTOMATIC steel shelving is available in all types, too. Open, closed, bin units, ledge units, counter units, and cabinets are made of prime steel, phosphate coated, and finished in baked-on enamel. Standard is SPS green, other colors are available.

Investigate new Hallowell ERECTOMATIC before ordering shelving. You'll find it stocked by leading industrial distributors and shop equipment dealers everywhere. Contact the one nearest you. Or write Hallowell Shop Equipment Division, STANDARD PRESSED STEEL CO., Jenkintown 26, Pa.

*Patent applied for

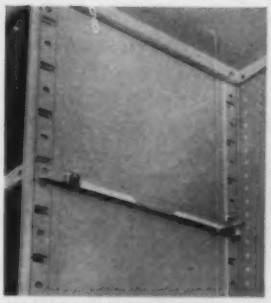
INDEPENDENT SHELF POSITIONING. Each shelf can be individually repositioned in seconds.

FULL USE OF SHELF AREA. No tees or angles, and beaded posts save valuable space.

COMMON SIDE PANELS AND POSTS save material between adjacent units in rack. Back and side panels are one-piece.

BEADED POSTS AND FLANGED SHELVES prevent snagging of clothing or stored goods, protect workers.

QUICK SHELF CHANGE. Release the locks, remove the shelf and its supports, relocate, and press the locks.



FULL DEPTH SHELF SUPPORT. No buckling possible. Reinforcements can be added when they are required.

4 CLASSES OF SHELVES. Regular, medium, heavy and extra-heavy construction meets all load requirements.

HALLOWELL® SHOP EQUIPMENT DIVISION

STANDARD PRESSED STEEL CO.

SPS

JENKINTOWN PENNSYLVANIA

For more facts circle 521 on Reply Card

For more facts circle 522 on Reply Card →

To be stocked by your G-E Distributor

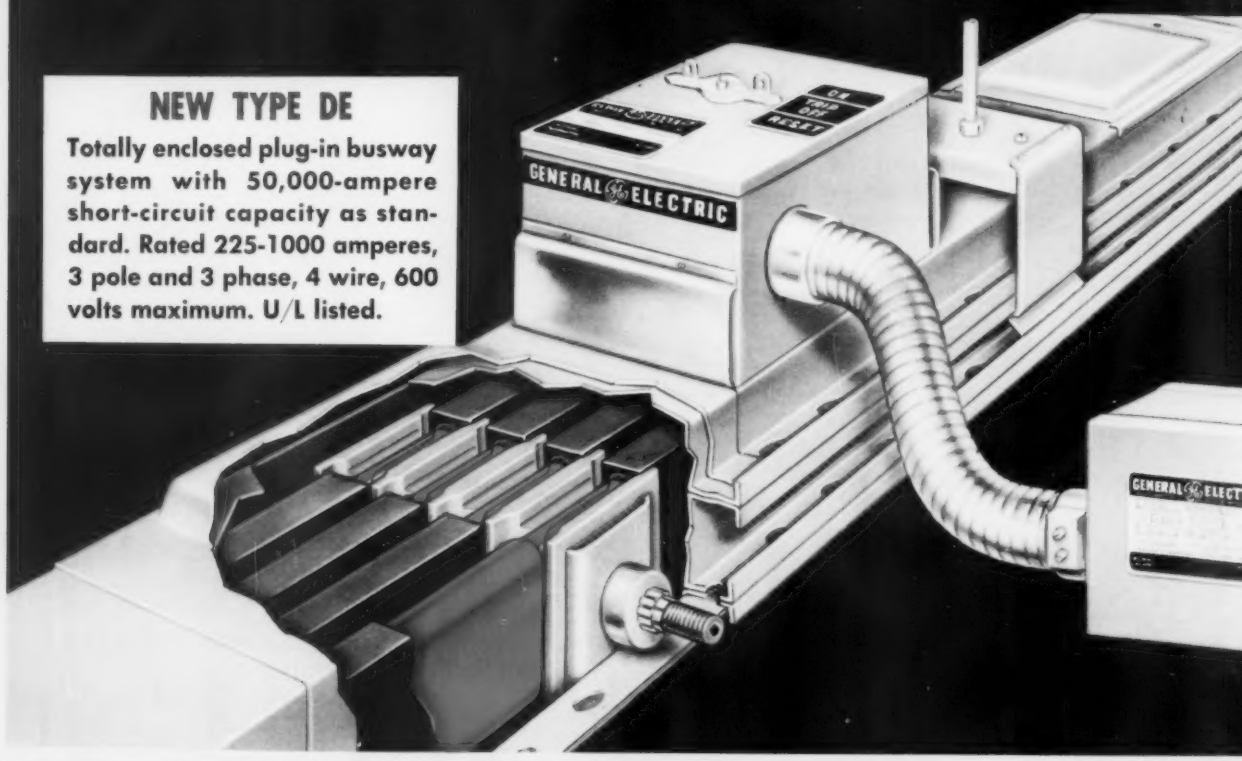
THE FIRST BUSWAY DESIGNED SPECIFICALLY AND EXCLUSIVELY FOR ALUMINUM

GENERAL ELECTRIC

2 NEW SYSTEMS—AMPERE
LIGHTEST, MOST EFFICIENT AI

NEW TYPE DE

Totally enclosed plug-in busway system with 50,000-ampere short-circuit capacity as standard. Rated 225-1000 amperes, 3 pole and 3 phase, 4 wire, 600 volts maximum. U/L listed.



WHY ALUMINUM?

In a recent study among contractors, consulting engineers and users three outstanding advantages of aluminum in busway were reported over and over: lower cost, lighter weight, availability.

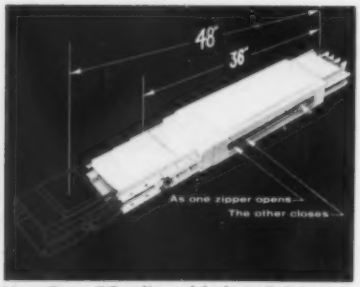
Market forecasts show that the use of aluminum will increase by 70% within three years *and by 1962 will account for two-thirds of all busway manufactured*. In the words of many engineers and contractors: "The market is logically shifting to aluminum."

G.E.'s new Type DE and DH busway offer these advantages of aluminum—plus entirely new advances in fundamental busway design. (See reverse side for full summary.)

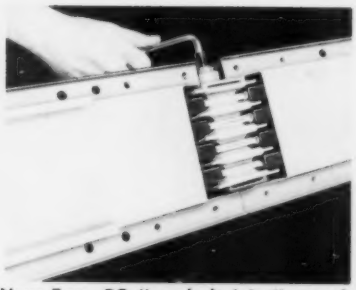
TYPE DE BUSWAY. This
sents the first *major advanc*

Its principal use is as a
mercial buildings—and to
fered by no other busway.

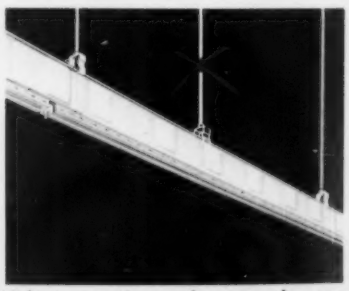
Type DE is up to 50%
of comparable rating. It ca
10% over-all. It virtually
offers the lowest voltage dr
of the major features that
portant in busway design.
busway that has everything



New Type DE adjustable length features unique zipper closure for built-in safety. New telescoping length adjusts between 36 and 48 inches . . . eliminates need for exacting layouts. Tandem zipper arrangement seals off opening to live parts for greater safety. As one zipper opens ahead of sliding handle, the other closes behind it.

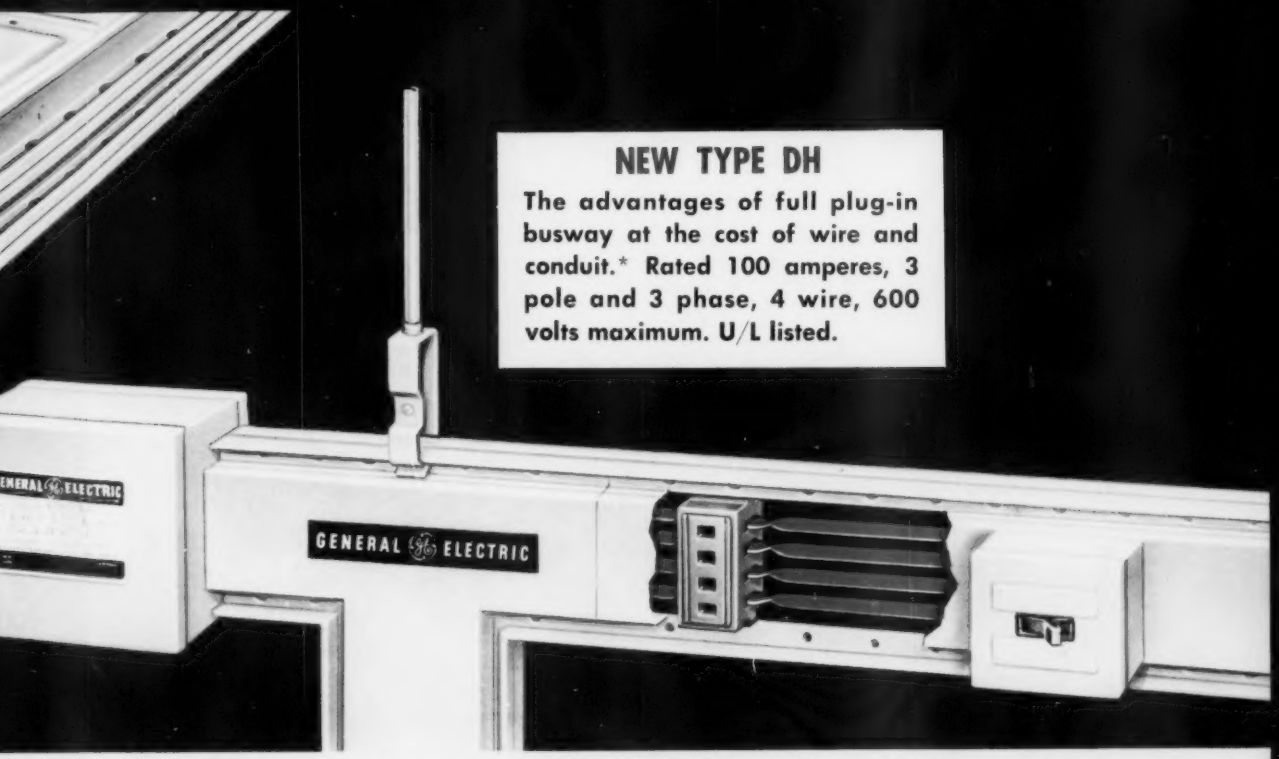


New Type DE "one-bolt joint" speeds assembly, maintains electrical contact with ton of force. Single, vise-like bolt, tightened with every-day wrench, exerts as much as a ton of force on overlapping conductors to make positive electrical contact at each joint. Twin joint cover plates provide sturdy mechanical joint connection.



10-foot mounting and snap-on hangers cut installation costs in half. Type DE busway's light weight and rugged construction permit hanger suspension at 10-foot intervals (instead of usual five) in *any* position under virtually *any* conditions. This unique advantage, plus snap-on hangers, reduces installation costs as much as 50%.

E FOR AMPERE, THE SMALLEST, AND RUGGED EVER DESIGNED!


NEW TYPE DH
The advantages of full plug-in busway at the cost of wire and conduit.* Rated 100 amperes, 3 pole and 3 phase, 4 wire, 600 volts maximum. U/L listed.
GENERAL ELECTRIC
GENERAL ELECTRIC

AY. This new light-weight, small-size busway repre-*ajor advance* in plug-in busway design in 15 years.
use is as a plug-in system in industrial plants and com-gs—and to these applications it brings advantages of-r busway.
p to 50% lighter and 30% smaller than other busway rating. It can save up to 50% in installation costs and t virtually eliminates need for custom engineering and t voltage drop available. In short, it incorporates *all* 22 atures that engineers, contractors and users say are im-vay design. That's why it has been described as "the s everything."

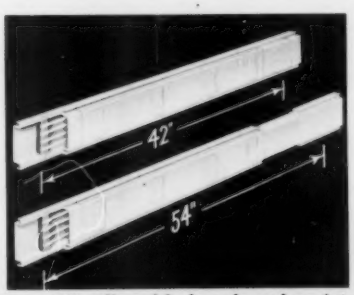
TYPE DH BUSWAY. *"*With Type DH I can save 25% on the cost of a conduit and wire job when there are four or more tap-offs on the system,*" said one of the leading electrical contractors in Wilmington, Delaware, after a field test of new Type DH. Type DH is *fully competitive* with conduit and wire systems on a total installed cost basis!

Type DH busway serves as either a feeder or plug-in system. It's equally at home in the large industrial plant or the small machine shop, in the commercial skyscraper or the school laboratory—in almost any indoor place where small blocks of power are desirable.

G-E Distributors stock Type DH busway, including its wide variety of fittings and accessories. to meet almost any job requirement. It thus matches wire and conduit in availability.

n hangers Type DE d construc-10-foot in-*n any* posi-tions. This hangers, re-as 50%.

New G-E Type DH busway may be mounted on 10-foot centers — installs quickly, easily. Underwriters' Laboratories, Inc. lists Type DH busway for suspension on 10-foot centers if it is mounted in the edgewise position. Mechanical and electrical joint connections are made by simply tightening six captive screws.

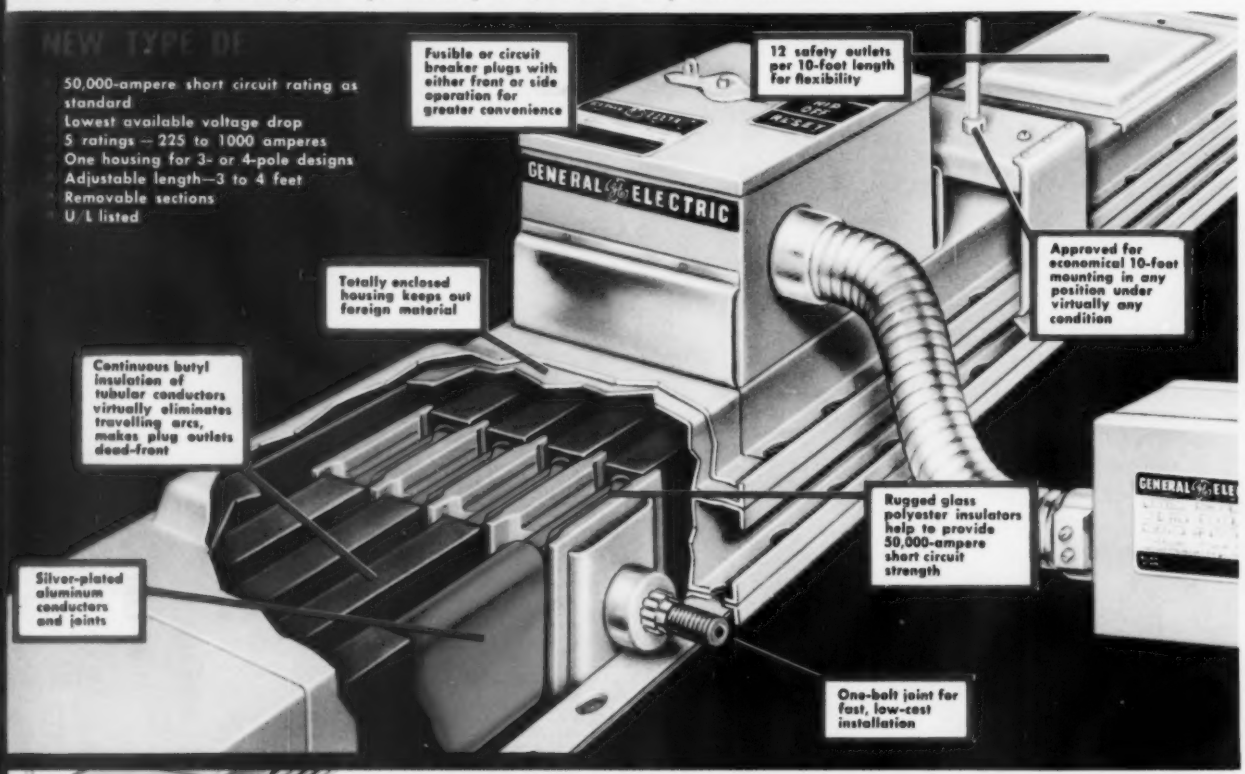


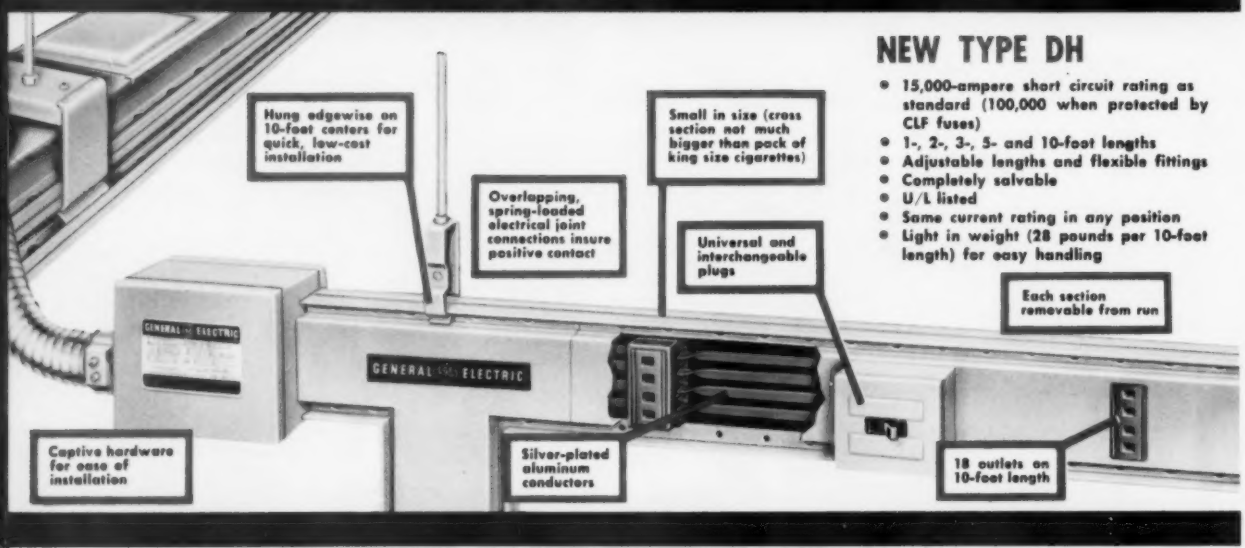
Type DH adjustable length and variety of fittings add flexibility. Telescoping length adjusts between 42 and 54 inches. This, plus flexible fittings, eliminates need for exact measurement. Rigid fittings — elbows, tees and crosses — adapt busway to virtually any building contour. Lengths can be easily removed from run.

Straight lengths of Type DH busway provide up to 18 outlets each. Outlets are arranged in pairs, back-to-back on busway. Nine of 18 outlets on 10-foot length may be used at same time. Outlet covers are quickly and easily removed with pair of pliers. Even after removal of covers, plug outlets are dead front for greater safety.

NEW GENERAL ELECTRIC TYPE DE AND DH BUSWAY

The first busway designed specifically and exclusively for aluminum


NEW TYPE DE
50,000-ampere short circuit rating as standard
Lowest available voltage drop
5 ratings — 225 to 1000 amperes
One housing for 3- or 4-pole designs
Adjustable length—3 to 4 feet
Removable sections
U/L listed
Fusible or circuit breaker plugs with either front or side operation for greater convenience
12 safety outlets per 10-foot length for flexibility
Totally enclosed housing keeps out foreign material
Approved for economical 10-foot mounting in any position under virtually any condition
Continuous butyl insulation of tubular conductors virtually eliminates travelling arcs, makes plug outlets dead-front
Rugged glass polyester insulators help to provide 50,000-ampere short circuit strength
Silver-plated aluminum conductors and joints
One-bolt joint for fast, low-cost installation
GENERAL ELECTRIC


NEW TYPE DH
• 15,000-ampere short circuit rating as standard (100,000 when protected by CLF fuses)
• 1-, 2-, 3-, 5- and 10-foot lengths
• Adjustable lengths and flexible fittings
• Completely salvable
• U/L listed
• Same current rating in any position
• Light in weight (28 pounds per 10-foot length) for easy handling
Hung edgewise on 10-foot centers for quick, low-cost installation
Small in size (cross section not much bigger than pack of king size cigarettes)
Overlapping, spring-loaded electrical joint connections insure positive contact
Universal and interchangeable plugs
Each section removable from run
Captive hardware for ease of installation
Silver-plated aluminum conductors
18 outlets on 10-foot length
GENERAL ELECTRIC

Type DE busway is described in Bulletin GEA-6173 and Type DH busway in Bulletin GEA-6172. For copies of these bulletins, see your nearest General Electric distributor or sales representative. Or write to **Distribution Assemblies Department, General Electric, Plainville, Conn.**

Progress Is Our Most Important Product

GENERAL ELECTRIC

WARNING!

Cutaway drawing of typical hydraulic cylinder. Orange shading indicates packing applications.

WHEN YOU CHANGE TO A FIRE-RESISTANT HYDRAULIC FLUID, CHANGE PACKINGS, TOO!

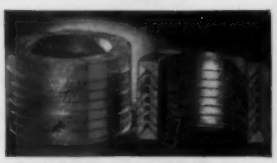
Here's why: Many fire-resistant fluids are highly destructive to the common rubbers used for packing mineral base oils.

The Garlock "ORANGE LINE" of packings has been developed specifically, and ONLY, for packing *phosphate ester* type fire-resistant fluids in dynamic applications.

The ORANGE stripe across the packings quickly identifies them as suitable for use against fire-resistant fluids. Butyl Rubber is the base material used in these packings and is *not* compatible with mineral base oils. Therefore the "ORANGE LINE" packings should only be used with the phosphate ester type fire-resistant hydraulic fluids.

*Registered Trademark

The Garlock "ORANGE LINE" for fire-resistant hydraulic fluids is available in CHEVRON* Packings, KLOZURE* Oil Seals, Split KLOZURES, U cups, flanges, O-Rings, and other forms of the Garlock 2,000 . . . two thousand different styles of packings, gaskets, and seals to meet *all* your needs. It's the only complete® line . . . it's another reason why you get unbiased recommendations from your Garlock representative. Call him today or write for further information on recommended packings for use against fire-resistant hydraulic fluids.



Garlock CHEVRON Packing set. Orange stripe quickly identifies packing as suitable for use against fire-resistant fluids.

THE GARLOCK PACKING COMPANY, Palmyra, New York

For prompt service, contact one of our 30 sales offices and warehouses throughout the U. S. and Canada

GARLOCK

Packings, Gaskets, Oil Seals, Mechanical Seals, Rubber Expansion Joints, Fluorocarbon Products

For more facts circle 523 on Reply Card

LUBRIPLATE
Nos. 130-AA, 630-AA and 930-AA
are grease type lubricants especially formulated for use in bearings and on other machine parts subject to heavy loads. Have extremely high film strength, marked adhesiveness and water repellence.

LUBRIPLATE
Nos. 4 and 8
are most satisfactory fluid type lubricants over a wide range of temperatures. Due to their high film strength, they are ideal for use where heavy loads are encountered.

REGARDLESS OF THE SIZE AND TYPE OF YOUR MACHINERY, LUBRIPLATE LUBRICANTS WILL IMPROVE ITS OPERATION AND REDUCE MAINTENANCE

For nearest LUBRIPLATE distributor see Classified Telephone Directory. Write for free "LUBRIPLATE DATA BOOK"... a valuable treatise on lubrication. LUBRIPLATE DIVISION, Fiske Brothers Refining Company, Newark 5, N. J. or Toledo 5, Ohio.

For more facts circle 524 on Reply Card

BACKTALK AND FORETHOUGHTS

Edited by Marjorie E. Weissman

Air Lines and Tank Construction

PLANT ENGINEERING:

"In one of your issues several months ago I believe you had some information on the sizing of compressed air lines and the construction of pumping tanks showing the proper location of suction and return lines and baffles. If you still have some literature available on the foregoing would you please send it to me.

"I also need information concerning the installation of inside and outside storage tanks put on concrete foundations. To be more specific:

"1. Concerning air space between bottom of tank and top of foundation.
"2. Waterproofing concrete between foundation and bottom of tank.
"3. Painting of tank to prevent corrosion.

"If you have any literature on the above items I would greatly appreciate receiving it." *John G. Neff, Lafayette Plant Engineer, Rea Magnet Wire Company, Inc., Fort Wayne, Ind.*

► The two articles to which Mr. Neff refers are "Sizing Pipe for Compressed Air?" and "What Helps, Hinders Pump Suction?" are both from our July, 1957 issue. Tear sheets of them have been sent to Mr. Neff, along with other sources of information. Comments and suggestions from our readers will be welcome.—*Editors.*

On the Road to Punxsutawney

PLANT ENGINEERING:

"The good people of Punxsutawney, Pennsylvania, won't like the Betz Laboratories, Incorporated of Philadelphia, Pennsylvania. In the August, 1957 issue of PLANT ENGINEERING there appeared an ad for Betz which used as a background a map of the portion of Pennsylvania in which Punxy, famous home of the Groundhog, is situated. For some strange reason, the map left out this bustling community of about 9000 souls but showed many places which are no more than crossroads places. 'No, I have never lived in Punxy." *C. A. Miller, Principal Architectural Engineer, Blaw-Knox Co., Chemical Plants Div., Pittsburgh, Pa.*

► To the sharp-eyed Mr. Miller who discovered this apparent oversight—was he using the ad as a road map?—the Michener Company replies in behalf of Betz Laboratories, Inc.:

"Wanting the background of the Betz ad to merely say 'map', we eliminated not only such easily recognizable names as Punxsutawney, but other Pennsylvania garden spots as well . . . Indiana . . . Tyrone . . . Johnstown . . . and last but not least Altoona!

"Our apologies to any Pennsylvania stalwart who might feel slighted for this oversight, but as we say in the ad, 'Wherever you are (in Punxy or Timbuctoo) the answer to your plant water problem is Betz'." *William J. Dunbar, The Michener Co., Philadelphia, Pa.*

Electrical Drops

PLANT ENGINEERING:

"Would you please let me have more information about the electrical drop fittings mentioned in the article 'Little Things Mean a Lot' which was published in your August, 1957 issue. I would like to know how they are installed and where they are available." *Gilles Fournier, Plant Engineering, Canadian General Electric Co., Montreal, Canada.*

► The author of the article, T. H. Atkinson, General Maintenance Supervisor of the Townsend Co., New Brighton, Pa., sends the following information:

"The electrical drops are installed in the following manner: Steel boxes, 4-in. square with hinged covers are installed above the equipment in various length rows, as required. Knockouts are all along the length of the boxes on about 2-in. centers. From each box we use General Electric Flamenol bus drop cable looped through an Adalet duplex component and hanging down to the various pieces of equipment.

"In the 4-in. box there are three lines to which the Flamenol bus drop cable is connected with Burndy connectors or any other type of quick connector. In the Flamenol bus drop cable is a ground wire which is connected to the starter or switch on the equipment and at the other end to the side of the 4-in. box."

Compressed Air for Tools

PLANT ENGINEERING:

"We would appreciate your sending us eight tear sheets of your article: 'Want Efficient Air Tools? Design Compressed Air System Right!' This

what's your plant water problem?

CONSULTANTS ON INDUSTRIAL WATER PROBLEMS

BETZ LABORATORIES INC., Philadelphia 24, Pa.

HOW YOU SAVE . . .

. . . getting drier Compressed Air

● Save the cost of cooling water and you save the price of the Niagara Aero After Cooler (for compressed air or gas) in less than two years.

Extra, for no cost, you get drier compressed gas or air for your process. You get better operation and lower costs in the use of all air-operated instruments, machines, or paint sprays. You save expense for piping, pumping, water treatment and disposal. You get the use of badly needed water elsewhere in your plant.

Niagara Aero After Cooler cools compressed air or gas (evaporatively) below the temperature of surrounding atmosphere, with no further condensation in your air lines.

Write for complete information; ask for Bulletin No. 130, or contact nearest Niagara Engineer if you have any problem involving the industrial use of air. Address Dept. PE-12.

NIAGARA BLOWER COMPANY
405 Lexington Ave., New York 17, N.Y.
District Engineers
in Principal Cities of U. S. and Canada

For more facts circle 526 on Reply Card

BACKTALK— FORETHOUGHTS

article appeared in the September, 1957 issue of your magazine." *R. K. Lee, Engineering Div., Barrett-Christie Co., Chicago, Ill.*

► Points to consider in the design of an efficient compressed air system for use with small tools are discussed in this article. Tear sheets have been sent to Mr. Lee with the compliments of the editorial department.—*Editors.*

We Never Tire of Hearing It

PLANT ENGINEERING:
"SAW COMPLETE STORY IN OCTOBER ISSUE ON HERCULES BOILER FOR FIRST TIME TODAY AND GREAT. WHOLE BOOK BEAUTIFULLY LAID OUT. THANKS. PLEASE SEND QUOTE ON 5000 REPRINTS." CHET MILLER, PASTUSHIN INDUSTRIES INC., LOS ANGELES, CALIF.

► The article which Mr. Miller refers to in his telegram is "Odd Jobs for Small Boilers: On-the-Spot Heating—Steam or Water." Tear sheets are available to readers interested in getting additional copies of the article. —*Editors.*

Isn't There An Easier Way?

PLANT ENGINEERING:
"We have a problem and, believe it or not, it concerns the outside front cover of PLANT ENGINEERING. Our problem is not serious, only an inconvenience.

"Because we route each issue to a number of our personnel, we attach a label to the cover. This label, unfortunately, covers the list of items 'in this issue,' making the list far less useful for its purpose.

"When, if ever, a change in the make-up of the cover is contemplated, if this list were to appear on the left side instead of the right, our labels would not lessen the effectiveness of the list.

"We are happy to read PLANT ENGINEERING and thankful that the cover surface coating does take ink from a ball point pen, which is a bit unusual for cover materials used by most publishers.

"If you would please inform us of a source where we may obtain information about the components for pneumatic sand conveyors, this would be appreciated, as is also your publication." *A. W. Lancaster, Engineering Research, Dorr-Oliver-Long, Ltd., Orillia, Ontario, Canada.*

► We are sorry that any aspect of PLANT ENGINEERING should cause a reader trouble, but it occurred to us that it would be a good deal simpler to redesign Mr. Lancaster's routing slip than to redesign the front cover of PLANT ENGINEERING. We have suggested that Mr. Lancaster send us a copy and let us work on it.

As for source of components for pneumatic sand conveyors, we have forwarded the names and addresses of manufacturers of this type of equipment, along with some tear sheets from the magazine which we hope will be of help.—*Editors.*

Advice to Engineers

PLANT ENGINEERING:
"I am enclosing an article which was run in 1940 by *Power Plant Engineering.* It was written by Louis E. Newman, the new president at Smithcraft . . . at that time he was still with General Electric Co. I came across the article with some material from Smithcraft and after reading it came to the conclusion that it is just as timely as it was 20 years ago. It may prove interesting to your readers." *Robert F. Friedmann, Parsons, Friedmann & Central Advertising Agency, Boston, Mass.*

► We agree with our correspondent that Mr. Newman's article, "Give the Answer First" is just as timely now as when it appeared in our companion publication, now *Power Engineering* and quote part of it for our readers:

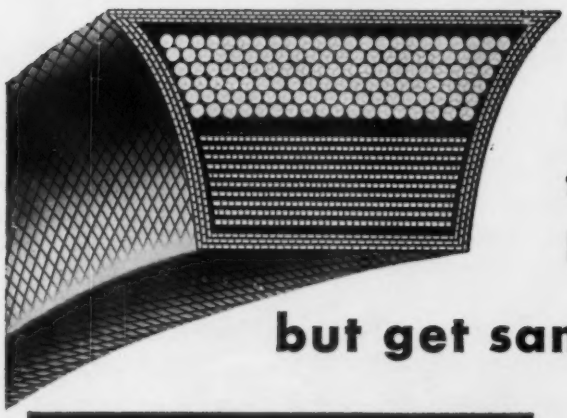
"There is a simple technique for expressing ideas clearly—give the answer first. It should be learned by all engineers. They, more than any other professional group, suffer from an inability to make their thoughts understood by others. The correct technique is this:

"1. Give the answer first—an arbitrary statement of fact that your listener can believe or not, but at least he will understand what you are trying to prove.

"2. Demonstrate by example—this makes the idea more tangible and teaches your listener its application. In fact he can now use your idea even though he may not be able to prove why it works.

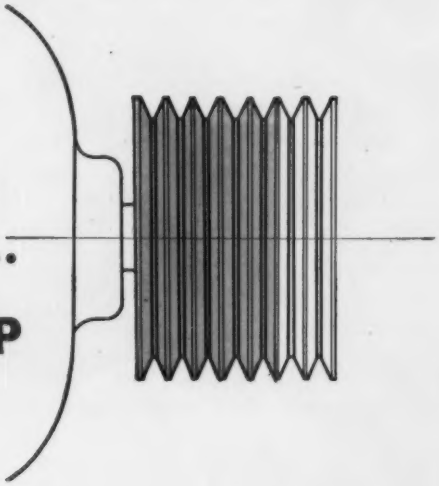
"3. Prove by theory—now your listener can learn why your idea will work. Note the 'can learn.' He knows what your idea is; he knows how to use it; and if he would like the information he can now learn why the idea is sound, but this is normally the least important part of what you say."

5 Gates Super Vulco Ropes do the work of 7 standard V-belts



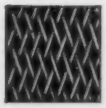
Use fewer belts...

but get same HP



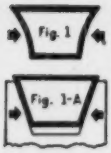
No other V-Belt has ALL these advantages

1. Flex-Weave Cover (U.S. Pat. 2519590)



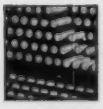
A Gates exclusive: provides greater flexibility with far less stress on fabric. Cover wears longer . . . increases belt life . . . more power available to driven machine.

2. Concave Sidewalls (U.S. Pat. 1813698)



Concave sides (Fig. 1) increase belt life. As belt bends, concave sidewalls become straight, making uniform contact with sheave groove (Fig. 1-A). Uniform contact means less wear on sides of belt . . . far longer belt life.

3. Tough, resilient Tensile Cords



Super strong resilient tensile cords provide 40% greater horsepower capacity . . . easily absorb heavy shock loads . . . reduce number of belts required save weight and space.

4. High Electrical Conductivity

Built into Gates Super Vulco Ropes for safer drives (in explosive atmospheres).

5. Oil, Heat, Weather Resistant

Special rubber compounds make Super Vulco Ropes highly resistant to heat, oil, and prolonged exposure to weather.

Cut sheave width and weight . . . design your drive to benefit from the greater HP capacity of Gates Super Vulco Ropes.

5 Gates Super Vulco Ropes will do the work of 7 Standard V-Belts. A Super Vulco Rope Drive delivers more HP per dollar invested than any standard V-Belt drive.

Sheaves with fewer grooves cost less . . . weigh less . . . occupy less space. Your drive design is improved.

Helpful drive data is quickly available to you. Simply call your nearby Gates distributor for advice from a Gates V-Belt Specialist. Stocks carried in industrial centers throughout the world.

The Gates Rubber Company
Denver, Colorado

TPA 264

Gates — The Mark of *Specialized* Research

Gates Super VULCO ROPE Drives

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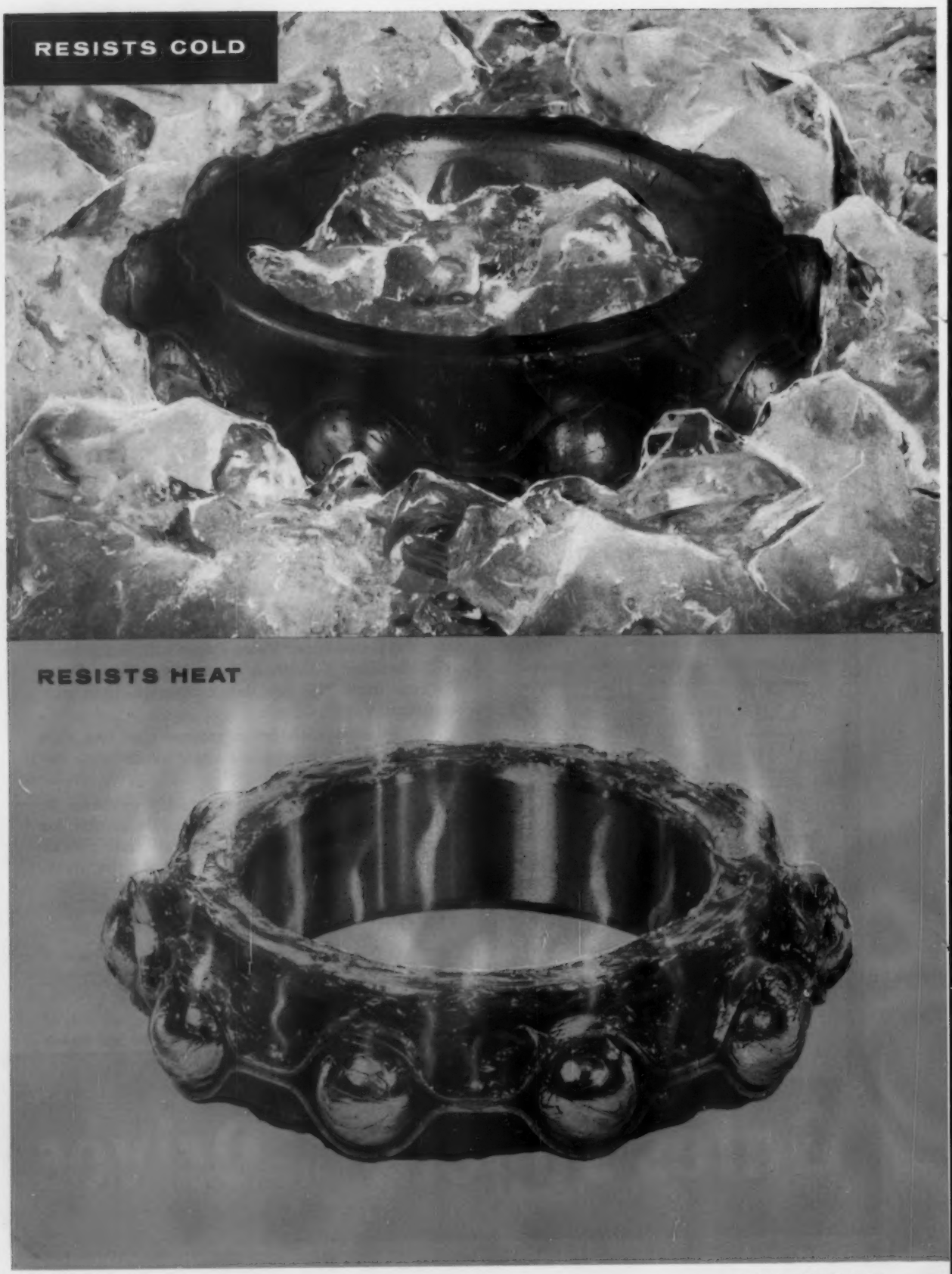

RESISTS COLD
RESISTS HEAT

NEW GULFCROWN GREASE

combats these three enemies of proper lubrication

HEAT, COLD, WATER—new Gulfcrown grease works under conditions where many other greases fail!

This superior new lithium-base lubricant resists leakage—has excellent high temperature performance. It has excellent pumpability at 0°F (even lower under certain conditions). It resists removal from bearing surfaces even when washed with water. It can be applied from a centralized grease system or by grease gun.

Since its introduction earlier this year, Gulfcrown has proved itself an impressive money-saver—in steel, paper, and textile mills, and many other types of manufacturing plants. Gulfcrown's exceptional stability under adverse conditions reduces grease consumption. Its ability to serve many purposes simplifies lubricant storage and handling—avoids application errors. If you're looking for a grease you can use practically anywhere, Gulfcrown is it. Comes in N.L.G.I. consistencies 0, 1, 2, 3. Call your Gulf Sales Engineer now, or send for free literature.

GULF OIL CORPORATION
Department DM, Gulf Building
Pittsburgh 30, Pennsylvania

GULF

THE FINEST PETROLEUM PRODUCTS FOR ALL YOUR NEEDS

For more facts circle 528 on Reply Card

PLANT ENGINEERS' DIGEST —so those who rush may read and know what's new

Edited by Marjorie E. Weissman

Translator for Computers

INPUT AND OUTPUT "LANGUAGE" or coding for most computers and electronic data processing machines differs widely between systems. The data output generated by one type of computer cannot be re-entered into a different type of computer without translation or decoding and recoding. With more large business organizations and industrial processing plants installing electronic data processing and in many cases more than one type of computer, the question of whether IBM can "talk" to Electrodata or if Electrodata can talk to Sperry-Rand becomes critical.

A computer language translator has been developed to translate data from the format of one computer to a format compatible with a different computer. Despite the fact that it inserts one more piece of electronic equipment into a data processing installation, it nevertheless increases the operational flexibility in cases where more than one type of computer is involved.

By using this computer language translator, data from one type of computer is translated into code of another type

EECo's method of tape-to-tape translation, using the translator, speeds translation by a factor of several thousand times and makes possible punched-card to punched-card conversion, IBM to IBM or IBM to another card, not now possible. *From a release of Electronic Engineering Co. of California, Santa Ana, Calif.*

Special Grease Solves Vacuum Filter Problem

PRODUCTION INCREASE worth $700.00 per day was obtained by a chemical manufacturing company by switching to a specially compounded grease for use in vacuum filter machines.

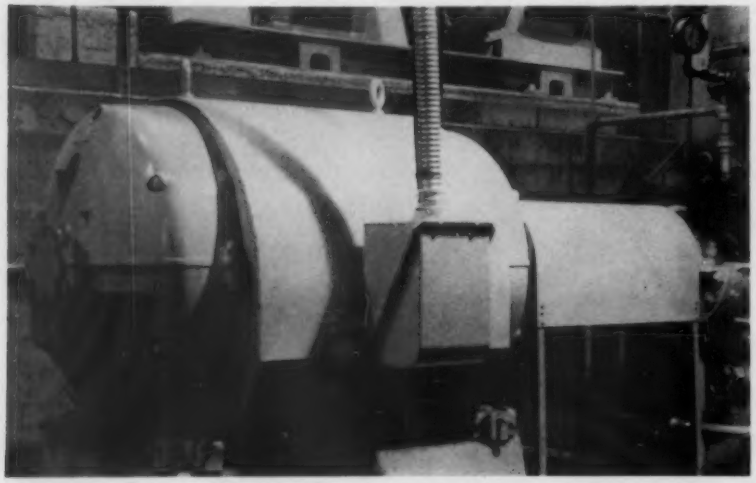
(Continued on page 46)

Silicone Tape Insulates Motors in Powerhouse, Saves $28,000

BY SPECIFYING SILICONE insulation instead of totally-enclosed fan-cooled frames for the main auxiliary drive motors in the powerhouse of their new plant at International Falls, Minn., the Minnesota & Ontario Paper Co. saved $28,000.

There are four motors involved: two 900 hp, 3600 rpm units designed to drive 735 gpm boiler feed pumps; one 600 hp, 900 rpm induced draft fan; and a 300 hp, 1200 rpm forced draft fan. All are 2300 volt, 3-phase, 60 cycle squirrel cage, induction motors.

All the motors have open type drip-proof frames. It was believed originally that the pulverized coal dust in the ventilating air might present a serious insulation abrasion problem. However, the Electric Machinery Manufacturing Company of Minneapolis supplied, at 62 per cent the cost of Class B insulated TEFC machines, open motors with dependable abrasion resistance. This was accomplished by wrapping every stator coil with two different types of silicone rubber tape. For maximum insulation value, the first layers were unsupported, semi-cured Silastic tape. For maximum abrasion resistance, the last layer was composed of same tape backed with glass cloth.



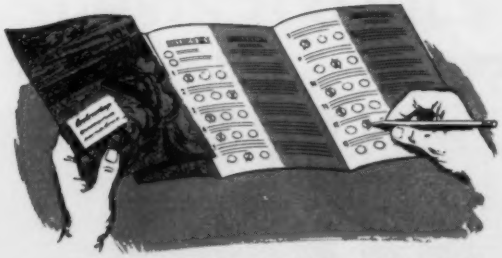
Motors insulated with a silicone tape, made totally-enclosed type unnecessary

Semi-vulcanized for handling ease, both tapes were cured out after wrapping to form a resilient, moisture-proof, one-piece insulating jacket.

Although these materials insulate the motors for temperatures in the 180 C range, they are being operated at lower temperatures. The margin of thermal stability is held in reserve against potential overloads. *From a release of Dow Corning Corp., Midland, Mich.*

Stop explosions before they blow

Send for the CROUSE-HINDS "Hazard Finder"



● The Hazard Finder will enable you to make a quick survey of the hidden probabilities of electrically-ignited explosions in your plant.

Let Crouse-Hinds equipment and technical assistance help you to prevent electrically-ignited explosions.

The more than 15,000 Condulet ® items in the Crouse-Hinds line, include the world's widest selection of explosion-proof and dust-tight electrical equipment. There are Condulet devices for every circuitry requirement, and for every hazardous area and condition. All backed by engineers and technicians thoroughly familiar with Article 500 of the National Electrical Code and its application to specific situations.

For a quick, general survey of probable dangers in your plant, send for the Hazard Finder. For technical discussion of specific areas and hazards, write for Crouse-Hinds bulletins which apply.

• Or for personal assistance, ask any of the offices listed below to send a Field Engineer.

FREE

CROUSE-HINDS CO.
Syracuse 1, N. Y.

I want to check my plant. Send me your Hazard Finder.

Name_____

Company_____ Title_____

Address_____

City_____ State_____

CROUSE HINDS

MAIN OFFICE AND FACTORY: SYRACUSE, NEW YORK
Crouse-Hinds Company of Canada, Ltd., Toronto, Ont.

● CONDULET® ELECTRICAL EQUIPMENT (Explosion-Proof and Conventional) ● FLOODLIGHTING
● TRAFFIC CONTROL SYSTEMS ● AIRPORT LIGHTING and WEATHER MEASURING EQUIPMENT

These products are sold exclusively through electrical distributors. For application engineering help, contact one of the following offices: Baton Rouge Birmingham Boston Buffalo Chicago Cincinnati Cleveland Corpus Christi Dallas Denver Detroit Houston Indianapolis Kansas City Los Angeles Milwaukee New Orleans New York Philadelphia Pittsburgh Portland, Ore. Salt Lake City St. Louis St. Paul San Francisco Seattle Tulsa Washington **Resident Representatives:** Albany Atlanta Baltimore Charlotte Chattanooga Jacksonville Reading, Pa. Richmond, Va. Shreveport

For more facts circle 529 on Reply Card

PLANT ENGINEERS' DIGEST

(Digest begins on page 44)

In addition, the company secured a 67 per cent reduction in maintenance costs; an 87 per cent reduction in amount of lubrication used; and a 50 per cent increase in operating efficiency.

The problem facing the company was a loss of product due to poor lubrication of continuous vacuum filter machines used for drawing phosphoric acid from wet gypsum cake. The valves in this equipment must be precisely adjusted to maintain the 18 in. of vacuum required to draw to maximum amount of acid from the gypsum cake.

Both cylinder oils and commercial castor oil were tried. Typical results showed that after valve adjustment, the highest vacuum obtainable was 18 in. This vacuum could be maintained for a short time only, after which it would drop, resulting in a high loss of acid.

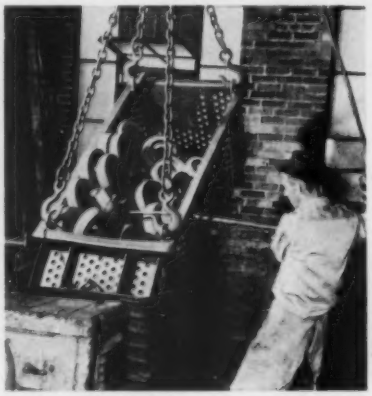
Use of fluid lubricants permitted the filter residue to clog the lubricant port valves, retarding flow of lubricant to the valve sealing surfaces. This reduced the vacuum and increased the time involved in maintenance, repair and valve cleaning.

When a specially compounded grease was used in an experimental run, the filter vacuum rose from 16 in. to 24 in. The grease is applied to the filter units by centralized lubricators. In addition to maintaining the required close valve adjustment, the character of the lubricant film enables the filters to sustain a high vacuum and consequent increased capacity. *From a release of Keystone Lubricating Co., Philadelphia, Pa.*

Pickling Crates

REPLACEMENT AND REPAIR of metal alloy crates used for pickling operations at the Williams Forging Co., Alliance, Ohio, was an expensive item.

Service life of the crates was short and the only practical method of repair was brazing, but joints did not hold up well. Constant care was necessary to avoid overloading the crates, which soon weakened since the metal pitted and embrittled after exposure to the 12 to 15 per cent, 180 F, sulphuric acid pickling solution.



Releasing pickled castings from crate

By using Monel crates, maintenance and replacement has been reduced, crates having been in service for 11 years. A capacity of 4000 lb has increased the pay load per batch of parts by 25 per cent over the old style crates. Crates handle all types of loads. *From a release of International Nickel Company, Inc., New York, New York.*

Tips on Using Copper Tubing

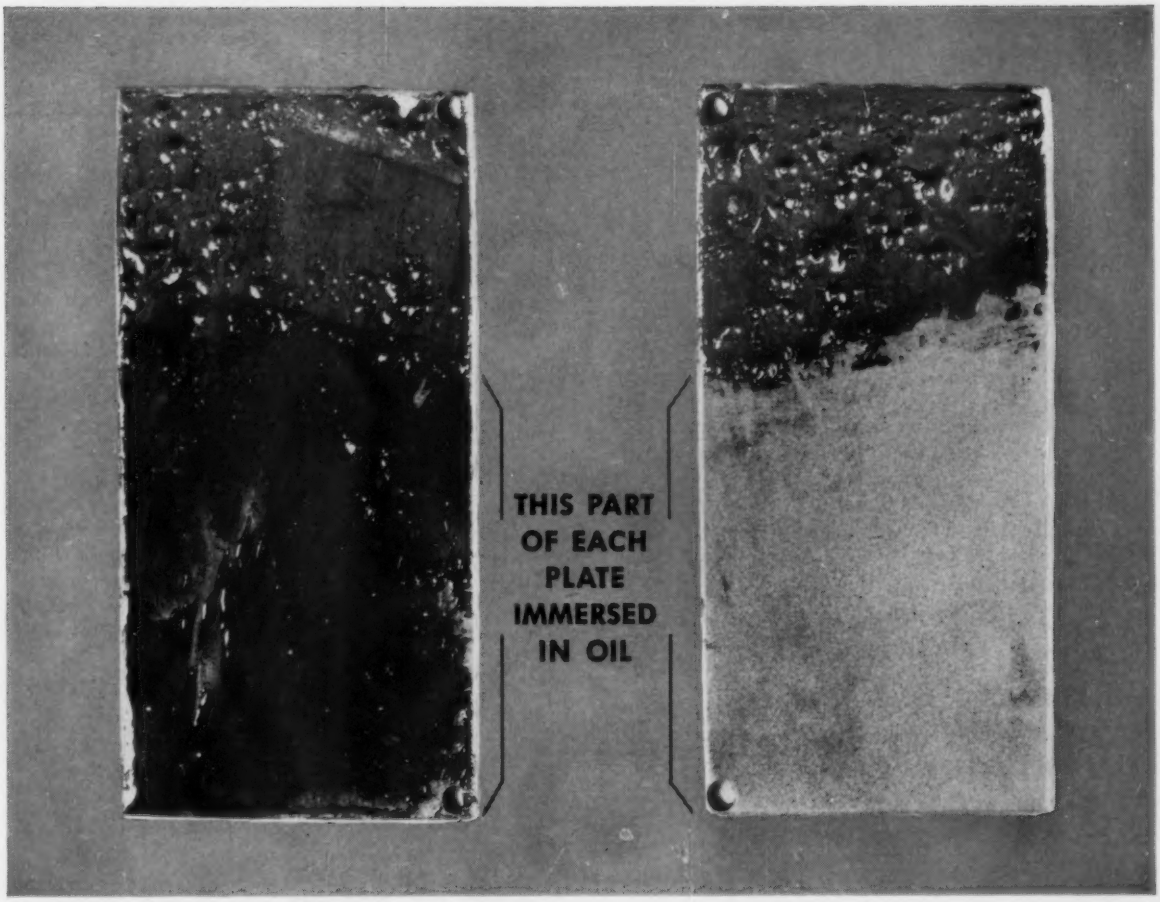
AS AN AID to men who work with copper water and drainage tube, the following tips are offered by our engineers:

1. *Application* — Generally, Type K tubing is used for underground installations. Its heavy wall makes it especially adaptable for this use. Type L is used mostly for interior and general plumbing installations. Type M tubing is recommended for stack waste and vent lines or other non-pressure applications.
2. *Temper* — Hard temper tubes are usually recommended where appearance is important and where sagging is detrimental. For instance, where a definite pitch is necessary to eliminate freezing or vapor locks, sagging would destroy the required pitch allowance. Because they are readily bent, soft temper tubes are used when tube must be worked around obstructions or between walls. It is more resistant to bursting, caused by freezing of water inside, than hard

(Continued on page 48)

Three-Step Air Conditioning Duct Insulation Installation Is Done in a Jiffy

Simple, fast installation of mineral wool duct insulation at Graflex, Inc., Rochester, N. Y., involves three steps: left, pins are welded to duct surface; center, board, cut to size, is impaled on pins; right, clips are slipped over pins to hold insulation. Ducts were installed above a luminous ceiling. (From a release of Baldwin-Hill Co., Trenton, N. J.)



This sludge-coated metal plate was partially immersed in a beaker containing a *regular hydraulic oil* heated to normal operating temperature. Though the oil was agitated throughout the test, nearly all the sludge remained on the plate.

This similarly sludge-coated plate was partly immersed in a SUNVIS 700 oil, also heated to normal operating temperature. During the same period, with the same degree of oil agitation, the immersed part of the plate was rinsed clean of sludge.

Simple test shows how

SUNVIS 700 OILS CLEAN HYDRAULIC SYSTEMS...WITHOUT SHUTDOWNS

Sunvis® 700 oils clean while they work. Their cleansing action removes deposits in systems contaminated by dust, sludge, varnish, and other foreign materials.

SUNVIS 700 oils carry these contaminants in suspension for easy removal. This eliminates costly teardowns. Systems stay clean. In addition to being ideal for hydraulic systems, SUNVIS 700 oils are also suited for circulating systems and gear boxes.

If you want exceptional cleaning ability, oxidation stability, rust prevention, film strength, you need SUNVIS 700 oils. Ask your Sun representative for full details, or write to SUN OIL COMPANY, Philadelphia 3, Pa., Dept. PY-12.

INDUSTRIAL PRODUCTS DEPARTMENT

SUN OIL COMPANY Philadelphia 3, Pa.

IN CANADA: SUN OIL COMPANY LIMITED, TORONTO AND MONTREAL

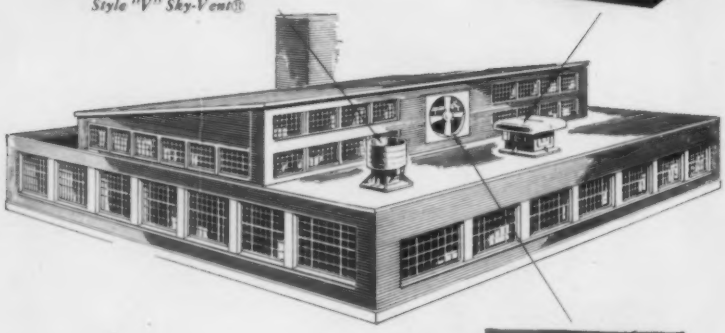
SUNOCO

©Sun Oil Co., 1957

For more facts circle 530 on Reply Card

Style "V" Sky-Vent®

Style "H" Sky-Vent®



VENTILATE AND/OR HEAT YOUR PLANT QUICKLY, EFFICIENTLY, AT LOW COST SUMMER OR WINTER

"BUFFALO" POWER ROOF VENTILATION — No plant is modern and efficient without adequate ventilation, and it need not be a major expense. "Buffalo" Sky-Vent Roof Ventilators have proved to be one of the most reasonable and completely satisfactory solutions. They're delivered to you as ready-to-run units; thus, you save on installation cost. They handle large plant areas without need for duct systems, a further saving. They're efficient, husky and weatherproof. In combination with heater sections mounted under roof openings — or with heating coils and various damper arrangements built integrally into Style "H" stack — they can readily be used for winter supply of heated make-up air. Write for Bulletin FM-2345 and check these "Buffalo" ventilation values with the "Q" Factor*!

"BUFFALO" PACKAGE PROPELLER FANS — Modest in first cost, and the most inexpensive fans to install, "Buffalo" Package Propeller Fans provide all the desirable features for heavy-duty industrial and commercial ventilation. In 24" to 120" sizes, they deliver fresh, live air to any area from a small room to a whole plant or a giant auditorium. Very efficient at slow speeds, they are unusually quiet — and built for a lifetime of low-cost, beneficial ventilation. Ask your Engineer or Contractor about "Buffalo" Fans, Heating and Ventilating Units or Central Air Conditioning Cabinets!

* *The "Q" Factor — the built-in Quality which provides trouble-free satisfaction and long life.*

"Buffalo"

BUFFALO FORGE COMPANY

166 MORTIMER STREET BUFFALO, N. Y.

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

Sales Representatives in all Principal Cities

INDUSTRIAL EXHAUSTERS BELTED VENT SETS PROPELLER FANS "E" BLOWERS-EXHAUSTERS

For more facts circle 531 on Reply Card

PLANT ENGINEERS' DIGEST

(Digest begins on page 44)

tubing. However, support is required to avoid objectionable sagging, as is provided in the case of ground lines.

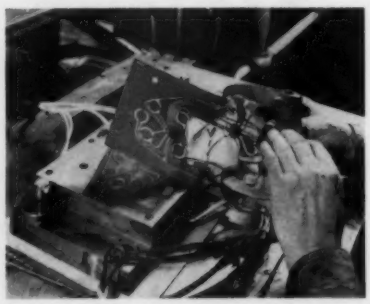
3. *Expansion-Contraction* — One hundred feet of copper water tube, subjected to 100 F temperature change will expand or contract approximately 1¼ in. in length. Therefore, allowance must be made for expansion and contraction when lines are installed.

4. *Bending* — Bending is more economical than using fittings — and this should be taken advantage of where possible. Soft copper tubes should be bent gradually — never abruptly. They should never be bent over sharp edges — or else kinks may result which will restrict flow.

5. *Tube Fittings* — Flare type and solder type fittings are both obtainable for use with copper tubing. Flare fittings are well adapted for use with soft tubing; solder type with hard tubing. Soft or silver solders can be used. In either case it is imperative that the surfaces of the tube and fittings are clean and that they are heated properly to assure a free flow of solder and to permit the entire surface of the joint to be filled. *From a release of Wolverine Tube Div., Calumet & Hecla, Inc., Detroit, Mich.*

Heavy-Duty Printed Circuits

USE OF MOLDABLE BOARD based on a variation of conventional phenolic paperboard already used for



Excess copper is trimmed from board

printed circuits, has made it possible to increase amperage and so produce heavy-duty printed assemblies. In addition, assembly line

SOLUTION . . . IN SECONDS

Your preventive maintenance specialist specifies a certain size and type of Whitney chain for immediate replacement on a vital production machine. He knows that Whitney Chain will do the job more efficiently and dependably . . . plus an often vital factor—"no lost time" in obtaining the particular chain or part needed.

A phone call to your Whitney Distributor means fast, off-the-shelf service, saving your production time and money. And Whitney's latest chain design advancements can contribute still more to your plant's efficiency.

For example, Whitney's Self-Lubricating Single and Double Pitch Roller Chains outlast regular chains as much as 5 to 1 under rugged field conditions of dust or moisture. They also help eliminate product contamination and spoilage on equipment where normal external lubrication cannot be applied. These benefits result from Whitney's exclusive sintered steel chain bushings which "oil from the inside" . . . are prelubricated for life.

And Whitney's *fatigue resistant* Processed Roller Chain is establishing new service standards for durability, particularly on problem drives involving unusual operational conditions, stresses and heavy shock loads. This performance comes from the exclusive Whitney process which offsets excessive operational stresses in the chain.

Whenever you need power transmission or conveying chain drives, your alert Whitney Distributor is always ready with a complete line of A.S.A. Chains and Sprockets. His service is backed up by Whitney Field Engineering Offices and Warehouses across the country.

Whitney helps you keep ahead of competition.

Whitney

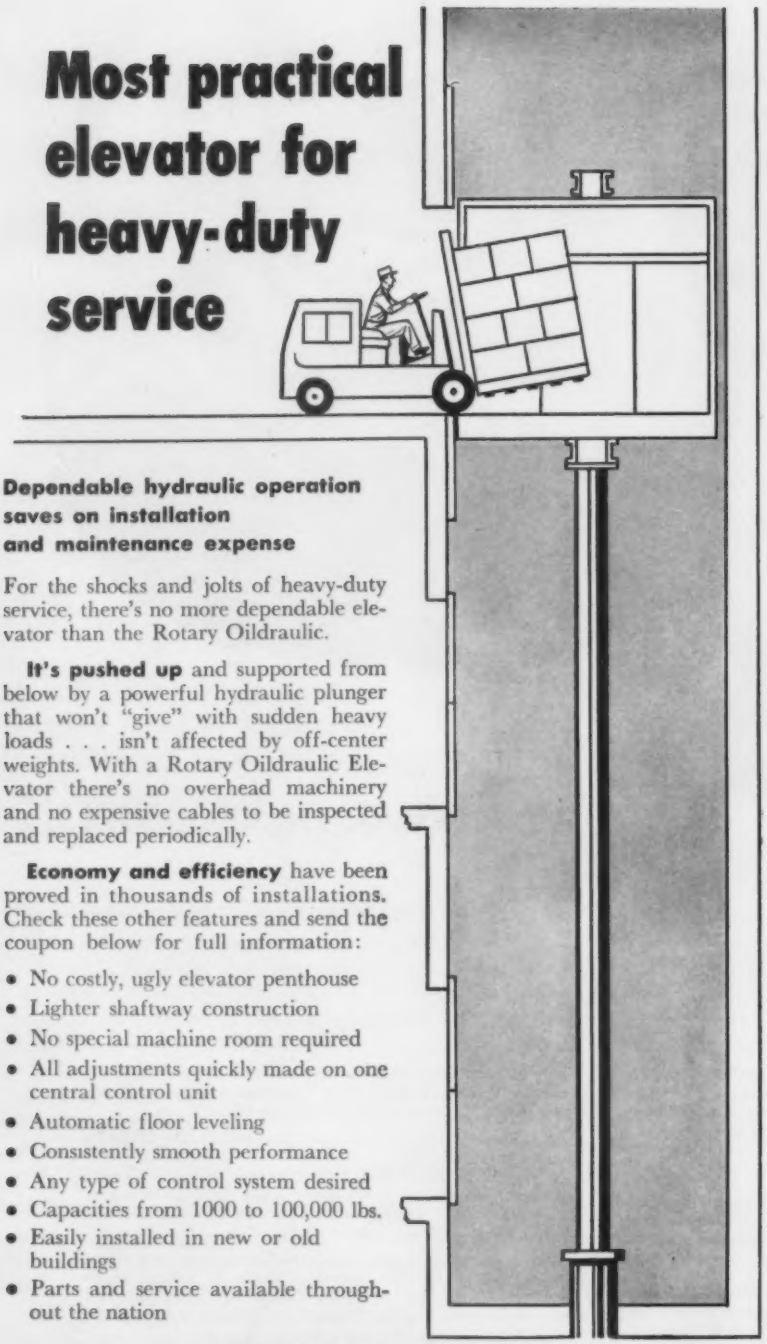
CHAIN COMPANY

232 HAMILTON ST., HARTFORD 2, CONN.

ROLLER CHAIN • SILENT CHAIN • CONVEYOR CHAIN • SPROCKETS • FLEXIBLE COUPLINGS

For more facts circle 532 on Reply Card

Most practical elevator for heavy-duty service



Dependable hydraulic operation saves on installation and maintenance expense

For the shocks and jolts of heavy-duty service, there's no more dependable elevator than the Rotary Oildraulic.

It's pushed up and supported from below by a powerful hydraulic plunger that won't "give" with sudden heavy loads . . . isn't affected by off-center weights. With a Rotary Oildraulic Elevator there's no overhead machinery and no expensive cables to be inspected and replaced periodically.

Economy and efficiency have been proved in thousands of installations. Check these other features and send the coupon below for full information:

- No costly, ugly elevator penthouse
- Lighter shaftway construction
- No special machine room required
- All adjustments quickly made on one central control unit
- Automatic floor leveling
- Consistently smooth performance
- Any type of control system desired
- Capacities from 1000 to 100,000 lbs.
- Easily installed in new or old buildings
- Parts and service available throughout the nation

MAIL NOW FOR MORE DATA

Rotary®
OILDRAULIC® ELEVATORS
Rotary Lift Company
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Memphis, Tenn.—Chatham, Ontario

ROTARY LIFT CO.
1024 Kentucky, Memphis 2, Tenn.
Send complete information on ( ) freight ( ) passenger elevators to:

*Name*_____

*Address*_____

For more facts circle 533 on Reply Card

PLANT ENGINEERS' DIGEST

(Digest begins on page 44)

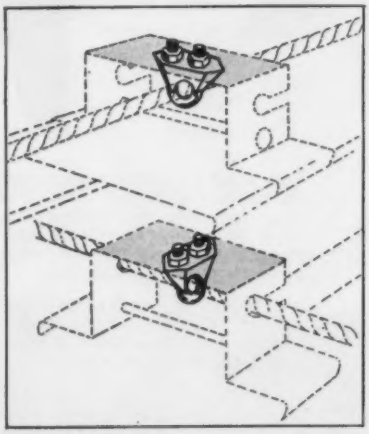
methods and design freedom in contoured surfaces are also possible.

The metal design for conducting electricity can be adhered to the board by mechanical means and a technique has been devised which eliminates the acid-etching step, thus facilitating the mass production of printed circuits.

In the first manufacturing step, an adhesive-backed copper sheet is laid over the uncured board and the circuit pattern stamped into it. The punch impresses the copper below the surface of the board, adhering those parts which will form the circuit. Excess copper is stripped away and salvaged for further use.

To complete the operation, the board is fed to a standard compression molding press, where its final mechanical and electrical properties are obtained by curing. *From Bakelite Review, published by Bakelite Co., Div. Union Carbide Corp., New York, N. Y.*

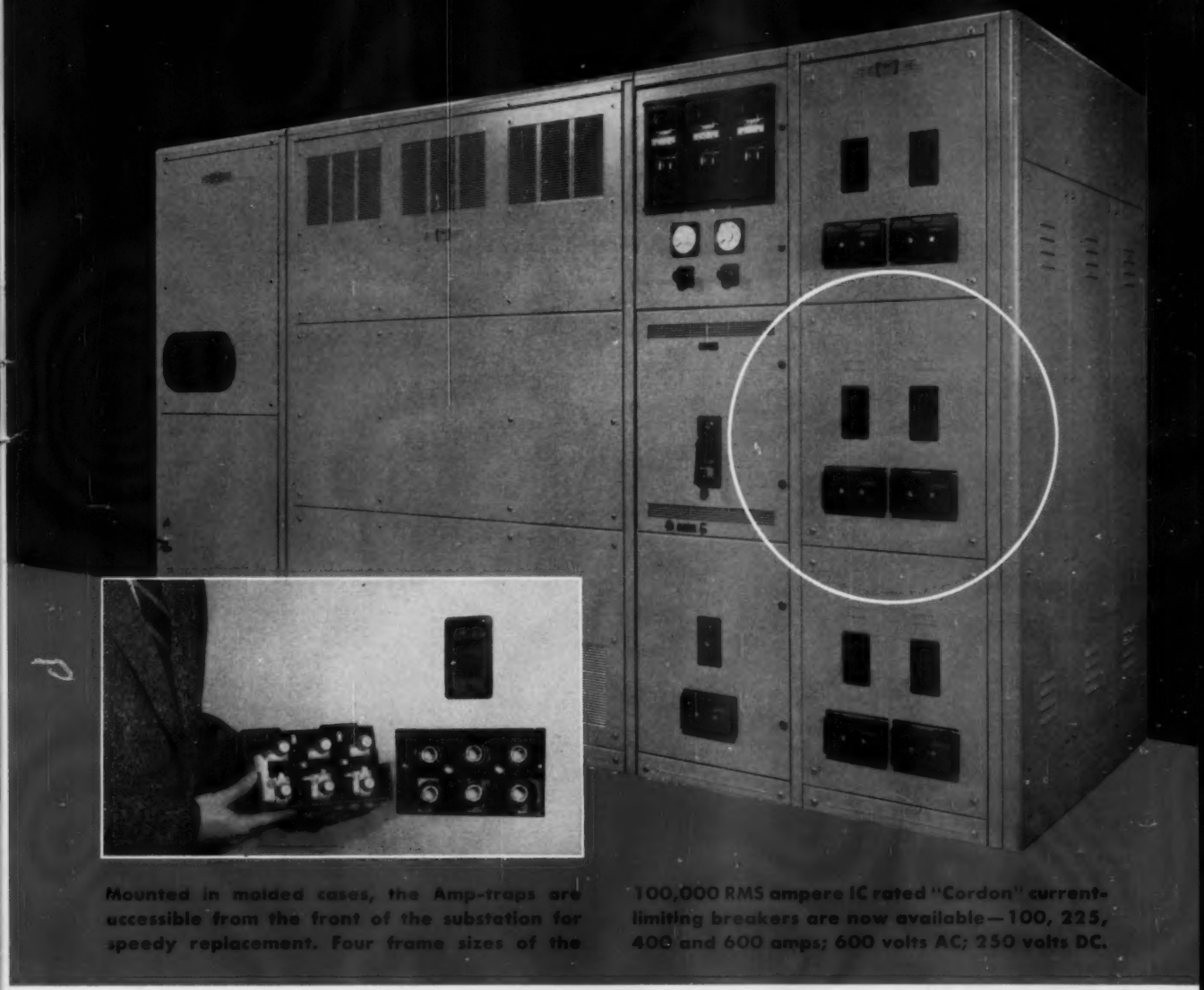
Fittings for Fluorescents



Cable, run in continuous rows, is held by wire rope clips attached to fixture channels by clamp hangers, providing rigid mounting for fluorescent lights. (From a release of Malleable Iron Fittings Co., Branford, Connecticut)

Compressor Silencer

SILENCING THE DISCHARGE from two, 8-cylinder compressors of 40-in. bore and 14-in. stroke, used to exhaust air from a closed chamber to the atmosphere, was a problem



Mounted in molded cases, the Amp-traps are accessible from the front of the substation for speedy replacement. Four frame sizes of the 100,000 RMS ampere IC rated "Cordon" current-limiting breakers are now available—100, 225, 400 and 600 amps; 600 volts AC; 250 volts DC.

BullDog Unit Substations provide greater protection against high short circuits with new "Cordon" current-limiting breakers

Protect your equipment! Fault currents of 100,000 RMS amperes can destroy equipment by arcing, burning and magnetic distortion. The new BullDog unit substation with "Cordon"* breakers provides this necessary protection.

"Cordon" breakers bring real savings, too, since they can be used where more costly air breakers were once required. They combine the advantages of standard thermal magnetic breakers with current limiting characteristics of Amp-traps** . . . limit damaging fault currents to low values.

Let a BullDog field engineer give you all the facts about unit substations and complete BullDog electrical distribution systems today.

© BEPCO

IF IT'S NEW . . . IF IT'S DIFFERENT . . . IF IT'S BETTER . . . IT'S

BULLDOG

ELECTRIC PRODUCTS COMPANY

A DIVISION OF I-T-E CIRCUIT BREAKER COMPANY

BullDog Electric Products Company, Detroit 32, Michigan • A Division of I-T-E Circuit Breaker Company • *Export Division:* 13 East 40th St., New York 16, N.Y. *In Canada:* BullDog Electric Products Co. (Canada), Limited, 80 Clayson Rd., Toronto 15, Ont.

*Trade-mark registered by I-T-E Circuit Breaker Company **Trade-mark registered by Chase-Shawmut Company

For more facts circle 534 on Reply Card

Moving 2 million lbs. of freight daily on

NOELTING Faultless CASTERS

The West Coast terminal of Pacific Intermountain Express, uses a 1400-ft. long Towveyer system to provide unmatched service. This system, one of the nation's longest, was developed to *reduce materials handling costs,* a major expense in the transportation industry. Over 1200 Faultless castered carts move over 2 million lbs. of freight daily, so that 144 trailers can be serviced at one time. Faultless 900GS Series Grease Sealed Double Ball Bearing Swivel Plate Casters are used in this huge system.

Gives positive protection to Swivel and Wheel Bearings wherever Dirt, Steam, Chemicals or Water are encountered.

Faultless Series 900GS medium duty, double ball bearing swivel plate casters are ideally suited to continuous operation. All bearings are sealed against dust, grime and water to protect the lubricated balls and raceways and to cut the cost of frequent re-lubrication.

Series 900GS Casters are available with Semi-Steel, Rockite and Plaskite (hard tread) Wheels and Rubber Tired, Vulcanized and Ruberex (cushion tread) Wheels in 5", 6" and 8" diameters and with load capacities ranging from 240 to 650 lbs. per caster.

SERIES 9700GS Rigid Plate Caster

Available with wheel types and sizes, load capacities and overall heights to match companion Series 900GS Swivel Plate Caster.

ASK YOUR DISTRIBUTOR

Your Faultless Distributor maintains a substantial inventory of Faultless Casters for immediate delivery. He and one of the Faultless Sales Engineers are available to work with you on every handling problem in your plant. Both are listed in the Yellow Pages, under "Casters," beneath the Faultless heading.

Send for FREE Illustrated Literature

Write for complete Facts on P.I.E. operation.

Also get free 900GS Catalog Page.

Faultless CASTER CORPORATION
Evansville 7, Indiana

Please send ☐ copy of P.I.E. Facts, ☐ 900GS Caster Cat.

Name_____

Firm_____

Address_____

City_____ State_____

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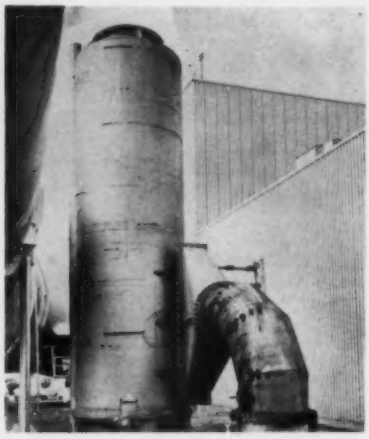
PLANT ENGINEERS' DIGEST

(Digest begins on page 44)



Water separator snubber does job of silencing compressor exhaust and, at the same time, separates water and oil

at the National Advisory Committee for Aeronautics Lewis Flight Propulsion Laboratory in Cleveland, Ohio. Oil from the discharge of other vacuum pumps was also a nuisance in the area.

Initial plans to overcome this situation called for the installation of an exhauster head on top of the silencer, into which water would be sprayed in an attempt to remove the entrained oil from the air stream.

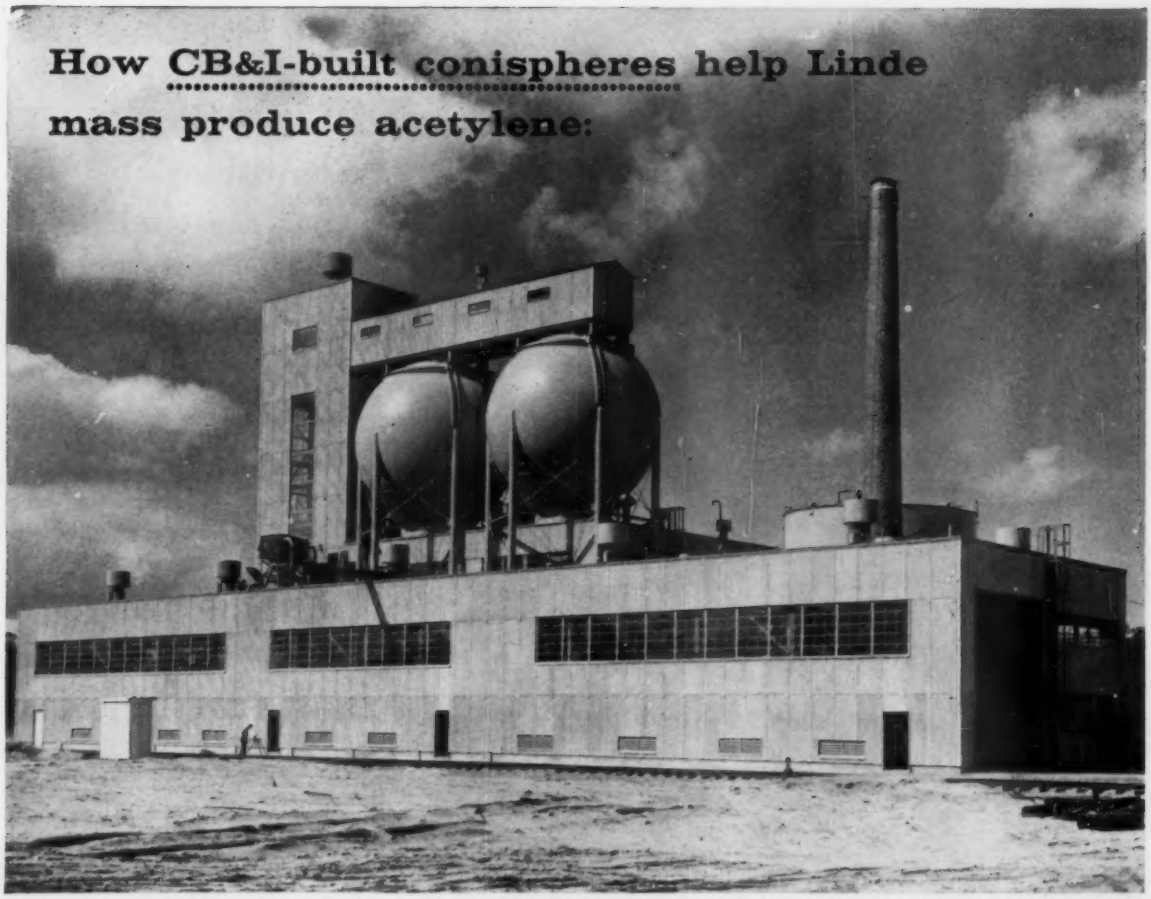
After an engineering study was made, NACA installed a water separator snubber, 9 ft in diameter, 35 ft tall, eliminating the need and cost of the exhauster head. It handles up to 100,000 cfm of air and separates up to 1200 gpm of water from the exhaust stream.

The water, introduced in the inlet nozzle of the separator, is used to wash all oil out of the air stream. Oil and water drop into a sump and the oil is separated by an overflow arrangement, leaving the water ready to recirculate. *From a release of Burgess-Manning Co., Libertyville, Ill.*

"One-piece" Heating Coil

EVERY SIX MONTHS Poetsch and Peterson, a tanning plant in South San Francisco, had to halt production until leaky heating coils were replaced. Labor and material cost ran about $600 for each of the two

How CB&I-built conispheres help Linde mass produce acetylene:



Neoprene plant gets constant flow of raw material via direct pipeline.

The two 30-foot diameter CB&I-built conispheres (Hortonspheres® with conical bottom outlets) shown above serve as a vital link in Linde Company's new mass acetylene production plant at Montague, Michigan.

The 500-ton capacity structures are designed to keep a ready and free-flowing supply of calcium carbide available for generation into acetylene—one of the components for manufacturing *Neoprene*.

Through a unique "stockroom" arrangement Linde is able to maintain a steady flow of raw material to a nearby neoprene plant—via pipeline.

Standard or special steel plate structures such as these are a specialty and an "art" with CB&I. Whether you're building new or expanding—the extensive fabrication and erection facilities offered by CB&I enable us to work to your most *rigid* specifications. Write our nearest office for new literature on CB&I Field Erection Services.

Chicago Bridge & Iron Company

Atlanta • Birmingham • Boston • Chicago • Cleveland • Detroit • Houston
New Orleans • New York • Philadelphia • Pittsburgh • Salt Lake City
San Francisco • Seattle • South Pasadena • Tulsa
Plants in BIRMINGHAM, CHICAGO, SALT LAKE CITY and GREENVILLE, PA.
REPRESENTATIVES AND LICENSEES:
Australia, Cuba, England, France, Germany, Italy, Japan, Netherlands, Scotland

CB&I

E-51

Don't Overlook Fresh Air Supply When You're Looking For More Profits

PRODUCTION suffers when make-up air is not provided to replace that exhausted during process operations, paint spraying, etc. Now the simple and dependable way to deliver an adequate fresh air supply to the plant area requiring it and always at comfortable room temperatures is through Wing "FAS" (Fresh Air Supply) Unit Heaters. Exhaust fans then can operate at full efficiency. Processes are more closely controllable. Workers feel better and work better. Production is increased. More uniform quality is maintained.

Wing "FAS" (Fresh Air Supply) Unit Heaters are "package" units that require no elaborate duct work and thereby hold installation costs down. Operation is automatic with thermostat controls maintaining temperatures. *For other details ask for Bulletin FAS-1.*

L. J. Wing Mfg. Co. 177 Vreeland Mills Road · Linden · N. J.
DIVISION OF AERO SUPPLY MFG. CO. INC. In Europe: WANSON, Haren Nord, Brussels, Belgium

FRESH AIR SUPPLY HEATERS

FANS • UNIT HEATERS • DRAFT INDUCERS • BLOWERS • TURBINES

For more facts circle 537 on Reply Card

PLANT ENGINEERS' DIGEST

(Digest begins on page 44)

coils which were steel and wrought iron pipe with welded fittings. In the latest replacement, silver brazed bronze fittings and copper tubing were substituted making a heating coil system that is still in service after almost 14 years.

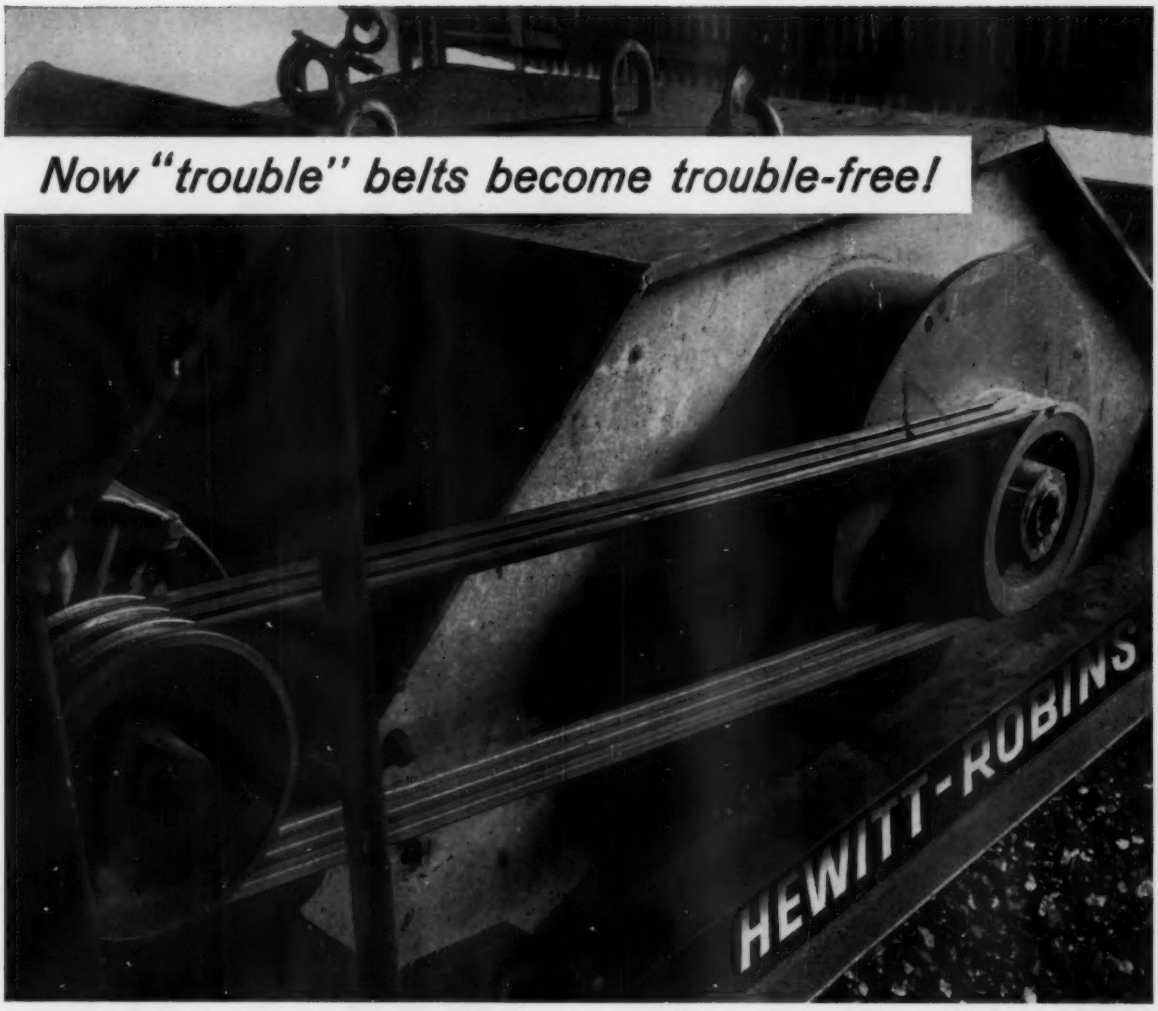
Steam flows through the coils which are enclosed in cylindrical tanks 16 ft long by 7 ft in diameter to heat the tank water. Leaks that formed in previously used ferrous piping six months after each installation, let water back up into the boiler, filling it above the required level. Before steam could be sent to the plant at the start of each day, the boiler had to be drained to its operating level. The tanks also had to be drained to repair or replace the coils.

The copper tubing with silver brazed joints amounts to a one-piece pipeline. The fittings are threadless bronze fittings with rings of silver brazing alloy.

Since adopting this system, the company figures it has saved more than $8000 by eliminating the semi-annual replacement of heating coils. Elimination of the shut-down time caused by failures of the previous coil systems provides a still bigger saving. *From a release of Walworth Co., New York, N. Y.*

Amphibious Fork Lift

Fork lift truck, designed for U.S. Army, can travel through water 5 ft deep, tilt body and forks 10 deg to maintain level load. (From a release of Clark Equipment Company, Battle Creek, Mich.)



Now "trouble" belts become trouble-free!

INDIANAPOLIS POWER & LIGHT COMPANY REPORTS:

Premium V-belts reinforced with DACRON last 52 times longer than ordinary V-belts on coal unloader

REG. U. S. PAT. OFF.

The Hewitt-Robins Car Shakeout in the receiving yards of the Indianapolis Power & Light Company needed new V-belts about every three weeks before its drive was switched to V-belts reinforced with "Dacron"*. In five years' operation only one belt change has been necessary—after three years' use. Despite the rugged operating conditions involved in unloading up to 30 hopper-car loads of coal a day, these belts made with Du Pont "Dacron" lasted 52 times longer than belts reinforced with conventional fiber.

The machine that uses V-belts reinforced with "Dacron" gets up to 40% more horsepower from its belt drives than is possible with other reinforcing fibers. The ability of these belts to withstand greater shock loads coupled with their longer flex life results in remarkable durability. They stretch less and are more stable than other belts . . . require far less maintenance. And design men find they can use fewer and smaller belts and sheaves, to meet today's demand for more compact, more economical belt drives.

For the next drive you design or install, consider the advantages of premium V-belts made with "Dacron". They combine the unique properties of "Dacron" polyester fiber made by Du Pont and the highest skills of leading manufacturers who make the belts. E. I. du Pont de Nemours & Co. (Inc.), Textile Fibers Department, Wilmington 98, Delaware.

**"Dacron" is Du Pont's registered trademark for its polyester fiber.*

DU PONT

REG. U. S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*

V-BELTS OF "DACRON" transmit more horsepower . . . stand greater shock loads . . . give longer flex life . . . give greater opportunities for machine-design improvement.

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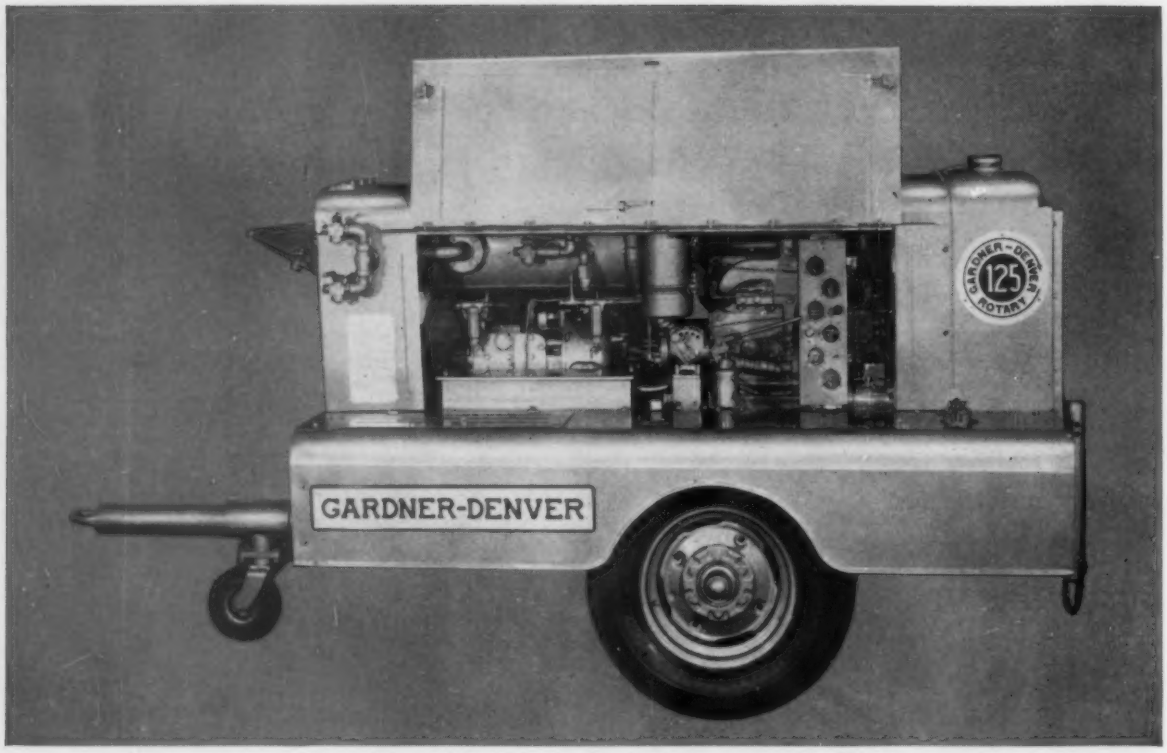

New Gardner-Denver Model RP125 rotary portable compressor, available with either gasoline or diesel engine.

This little rotary was designed big

Here's a portable that combines big Gardner-Denver rotary advantages into a small, compact workhorse: Clutch for cold-weather starting. Circulating water system that warms compressor oil before it turns over. Water cooling for steady running in any weather. Easy inspection. Easy maintenance. "THRIFTMETER"® control saves engine, compressor, fuel. If you need low-cost air, the Gardner-Denver Rotary 125 will deliver it.

Team up the RP125 with Gardner-Denver quality air tools.

Paving breakers

New T43 tamper

Utility drills

Also: sheeting drivers, clay spaders, trench diggers, impact too's, grinders, sanders and chippers, air hoists from 150 lb. to 2 tons. Write for descriptive literature today.

ENGINEERING FORESIGHT—PROVED ON THE JOB
IN GENERAL INDUSTRY, CONSTRUCTION, PETROLEUM AND MINING

GARDNER - DENVER

Gardner-Denver Company, Quincy, Illinois
In Canada: Gardner-Denver Company (Canada), Ltd., 14 Curity Avenue, Toronto 16, Ontario

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ROCKWELL-BUILT

new DELTA 20" drill press

...fills need for low cost production tooling

Delta's great new 20" Drill Press was designed, engineered and built to fill industry's growing need for *flexible* production tooling. Here is why it can save you money by handling jobs normally requiring machines *costing four and five times as much:*

BIG MACHINE CAPACITY—You get full 6" spindle travel and long 5½' high column for *extra* spindle to table capacity, backed by massive construction and rugged power to match! It's a real production tool for jobs ordinarily demanding big, expensive special-purpose machines.

POWER TOOL VERSATILITY—New Delta 20" can be used singly for a wide range of production jobs, yet readily adapts to work in combination with special-purpose machines. And you can move it *where you need it* to reduce materials handling, save costly man hours.

LASTING PRECISION—Delta's 30 years of unmatched quality power tool experience give you precision and performance features that assure exacting tolerances (and lower maintenance) through years of hard, continuous operation.

SEE THE ENTIRE DELTA DRILL PRESS LINE: Get all the facts about the new Delta 20" plus other new and improved Delta Drill Presses. Compare for quality, for precision, for value—and make up your *own* mind! Your Delta Dealer is listed under "TOOLS" in the Yellow Pages of your phone book.

Send coupon for all the facts!

DELTA ROCKWELL

another product by **ROCKWELL**

Delta Power Tool Division, Rockwell Manufacturing Co.
602M N. Lexington Ave., Pittsburgh 8, Pa.

- ☐ Please send complete catalog on entire Delta Drill Press line.
- ☐ Please send booklet: Delta Power Tools Teamed with Machine Tools.
- ☐ Please send names of my nearest Delta Dealers.

Name_____ Title_____

Company_____

Address_____

City_____ County_____ State_____

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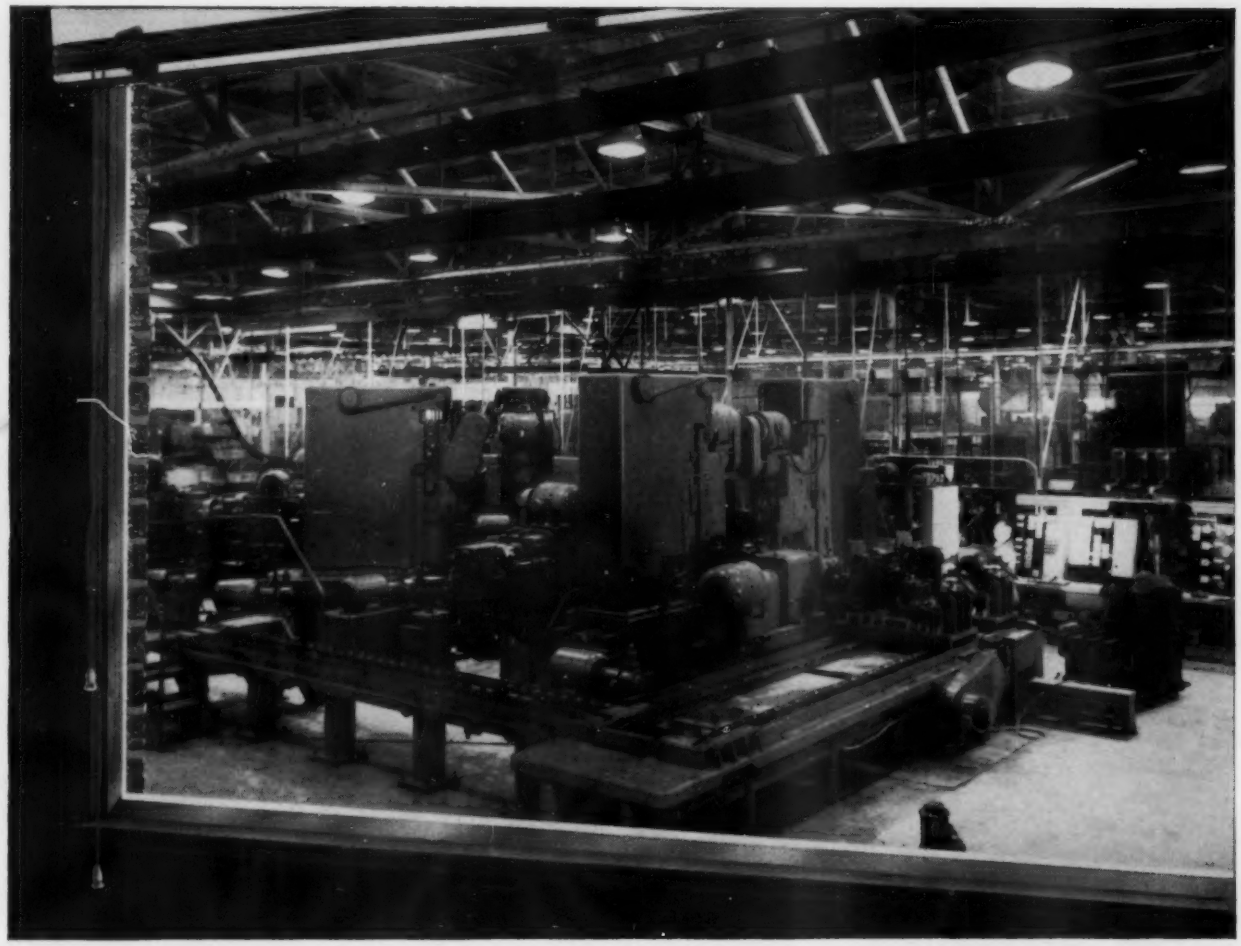
"We're ready for automation with high voltage power distribution"



When you're planning cost reduction with improved machinery and automated processes, power distribution in the plant is critical. Too often expensive machine tooling can't perform as planned because of voltage fluctuations, inadequate overload protection, or other distribution system limitations. A recent survey of plants in one metropolitan area shows that 88 percent have electrical problems that interfere with production.

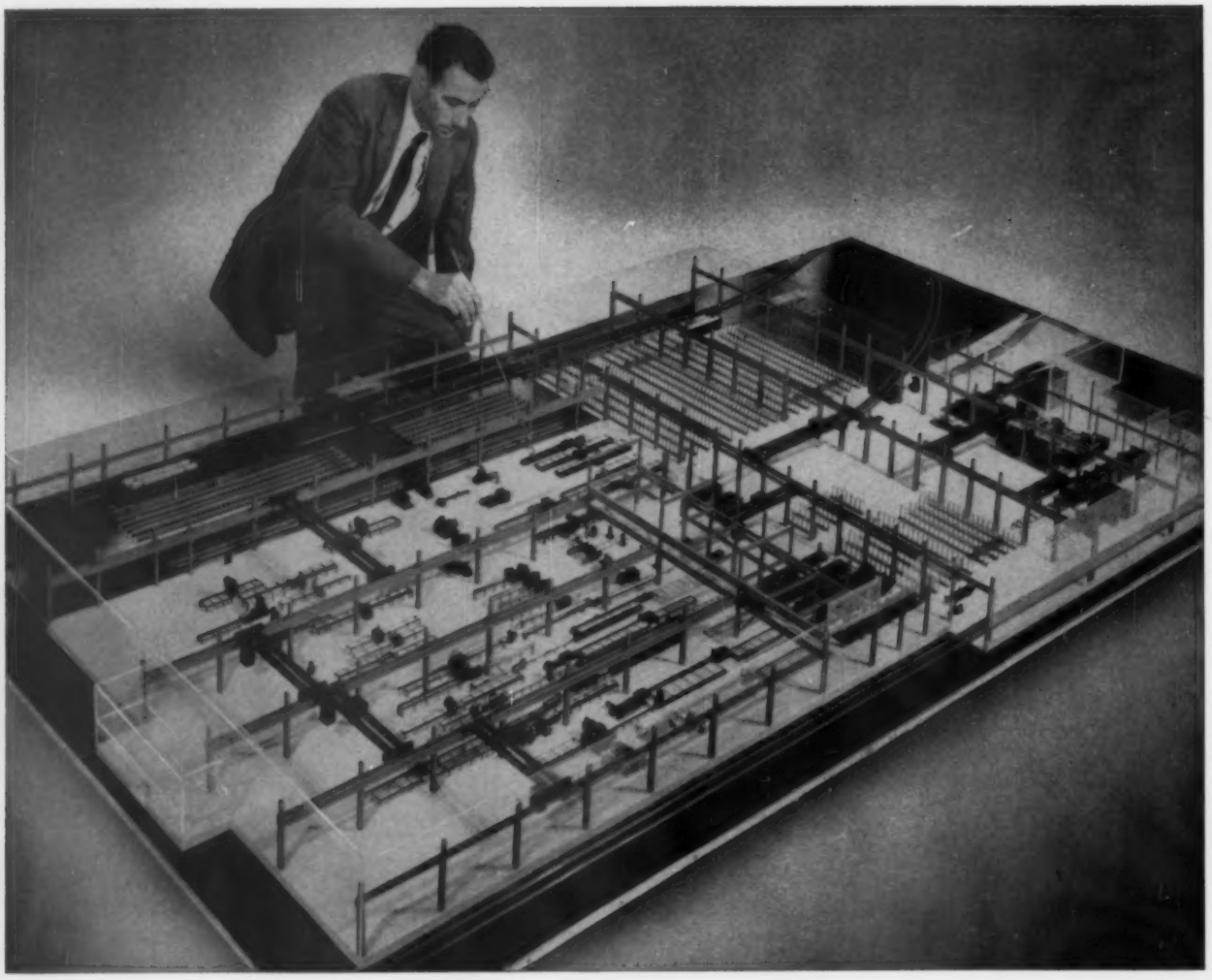
These problems won't exist if you prepare for production improvements with adequate power distribution. For example — if your plant load exceeds 1000 kva, or will exceed it in the future, plan for distribution at primary voltages . . . 4160, 6900 or 13,800 volts. It will result in cost savings, greater production flexibility and efficiency, compared to distribution at plant utilization voltage.

Plan ahead! After all, your total production depends upon the electric power distribution system which represents only 5 to 15 percent of the total plant investment. Ask your Westinghouse representative to help you plan for improved production through the use of higher voltage power distribution.

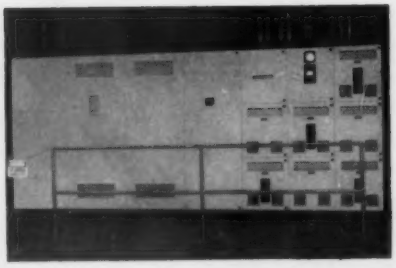
YOU CAN BE SURE...IF IT'S

Westinghouse

There's profit in planned power...



Westinghouse Shelterfor-M outdoor metal-clad switchgear offers complete independence from weather for maintenance. All work can be done from the inside.



Westinghouse power centers are located at the load. They are geared for today's production with "room-to-grow" flexibility for tomorrow's plant expansion.

Westinghouse Ampgard* high-voltage starters co-ordinate large-motor overload protection, short circuits and personnel protection; BAL-type fuse line-protection ratings to 400 amperes, fault interrupting capacity to 50,000 kva.

*Trademark

POWER-UP with Westinghouse

Show management more ways for cost reduction... with a power-system plan

Take a look at the fast-growing electrical needs of manufacturing in your plant. It's only average if kilowatt-hour consumption has jumped 8 percent each year for the last 10 years. The larger your load, the more you save with higher primary voltage.

Higher voltage, power-center distribution systems offer you . . .

1. Good voltage regulation — full power for production
2. Lower power bills
3. Lower investment in conductors.
4. Probable reductions in apparatus-and utilization-equipment costs

Your Westinghouse salesman can help with experienced counsel in selecting the right system and equipment. Westinghouse Electric Corporation, 3 Gateway Center, P.O. Box 868, Pittsburgh 30, Pa.

MP-3056

Characteristics of Distribution Systems

TYPE OF SYSTEM	Flexibility	Service Continuity	Regulation	Efficiency	Operation and Maintenance Cost	Initial Investment
Modern Simple Radial	F	F	D	C	A	A
Primary-Selective Radial	D	D	D	B	A	B
Simple Network	A	A	A	C	B	E
Simple Spot Network	C	A	A	D	D	E
Primary-Selective Network	A	A	B	A	C	D

LEGEND

A. 91-100% C. 71-80% E. 51-60%
B. 81- 90% D. 61-70% F. 41-50%

Approximate relative standing of five basic distribution systems. For detailed analysis of your system, consult your Westinghouse salesman.

YOU CAN BE SURE...IF IT'S

Westinghouse

Westinghouse DB circuit breakers provide protection in less space. They contain a multi-characteristic tripping device to prevent false shutdowns, 1) long-delayed tripping on temporary overloads, 2) short-delay tripping on larger overloads, 3) trips instantly on short circuits.

New Westinghouse control centers with completely interchangeable 9½" and 14" modular dimensions can save as much as 40 percent in installation costs over decentralized methods of mounting motor control. Save time in inspecting control and reduce servicing problems.

For more facts circle 541 on Reply Card

OPERATION AND PRODUCTION —pointers for the industrial plant engineer

Edited by Vernon T. Kempf

Weigh Wire for Fast Measure

Contributed by S. Clark

ELECTRICAL WIRE for plant jobs is commonly charged out by measuring incomplete coils on a wire measuring machine or by hand. When parts of coils are returned, to be credited back from a job, the wire again requires measurement.

Considerable time can be saved by weighing these coils of wire. When a coil is allotted to a job, it is weighed and the weight converted to feet. The wire returned is also weighed, converted to feet and deducted from the original amount.

A simple calculation tells how much wire was used and how many feet remain on the returned coil. A tag, hung on the coil, indicates the footage remaining, saving more time later when it is examined to see if it contains sufficient length for a proposed job.

Conversion tables have been made listing feet per pound of the most frequently used wire sizes in the plant. For example, a 250 ft coil of No. 14-2 Romex is weighed and minus the container, figures out to 14 ft per pound.

Spring scale, conversion table give answers to wire use, feet remaining

Thus if a 250-ft coil was charged out and the returned coil weighs 10 lb, 140 ft, this is subtracted from the full 250-ft length of the coil and 110 ft charged to the job.

Freezing Speeds Pipe Repairs

Contributed by Paul C. Ziemke

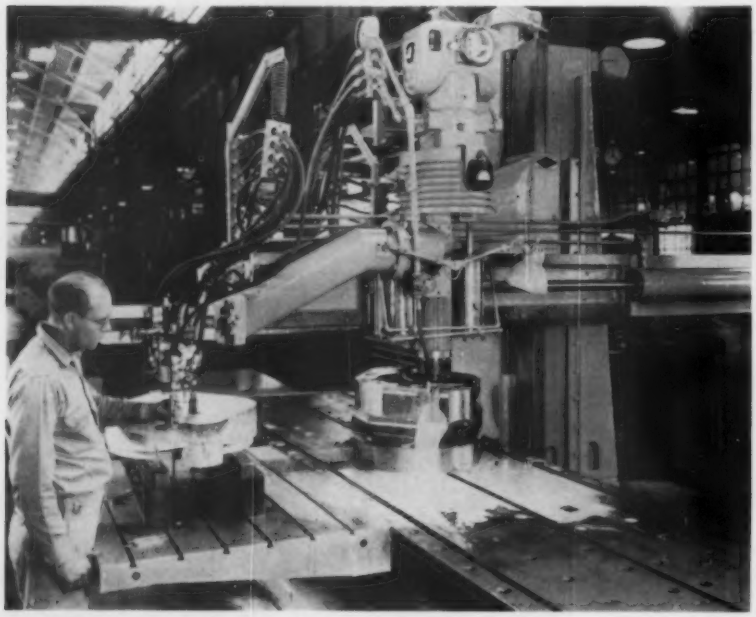
DAMAGED PIPES can be repaired without shutting off the main supply valve with this simple method. A box is built around the pipe, ahead of the leak, and filled with a mixture to freeze the liquid. Repairs can be made without delay and when completed, the freezing mixture is removed to permit normal flow.

The box should be about 16 in. long and about 10 in. square. With all the repair equipment on hand, place about 50 lb of crushed ice in a large can and add a bucket full of rock salt. Mix well and tamp

(Continued on page 64)

Maintenance Men Convert Open-Side Planer to Tracer-Controlled Milling Machine

DESIGNED AND CONSTRUCTED by the company's maintenance department, a three-dimensional, tracer-controlled milling machine was recently put in use at the Torrance, California, plant of the National Supply Company, manufacturer of oil industry equipment.



Tracer valve is deflected by template and controls motions of the machine. A pendant control is used to start and stop the spindle and for rapid traverse of table

All machine movements of the open-side, 48 in. by 48 in. by 16 ft planer were converted to hydraulic operation. A 25-hp, hydraulically-powered, variable-speed spindle replaced the planer tool-mount. Spindle speeds can be varied from 60 to 3000 rpm with two geared speed ranges. Vertical travel of the milling head is eight inches, provided by two hydraulic cylinders on opposite sides of the spindle housing. The milling head can be swiveled 45 deg each side of vertical. Feed rates for all movements range from 0 to 25 in. per min.

Hydraulic power for machine movements and spindle rotation is provided by a 30 hp combination hydraulic power unit with 20 gpm variable delivery pump to the spindle and a dual pump of 11 gpm capacity for table rapid traverse and 11 gpm for three directional feed movements. Cross and vertical rapid-transverse are accomplished by opening the tracer control valve for maximum feed.

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American Blower Model K Ventura Fan

Whisk away stale air with an American Blower Ventura Fan —the popular choice for all types of commercial and industrial applications, from cafeterias, laundries, offices to salesrooms, warehouses, factories.

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AMERICAN BLOWER

Division of AMERICAN-Standard

For more facts circle 542 on Reply Card

OPERATION—PRODUCTION

(O and P begins on page 62)

into the wood box around the pipe. The ambient temperature of the air plus that of the fluid in the line will determine how long it will take to freeze the spot solid. A small hole can be drilled into the pipe to determine if the flow has stopped.

Two parts of crushed ice and one part of rock salt will drop the temperature from plus 70 F to minus 5 F. Five parts ice, two parts salt, one part ammonium chloride will drop the temperature to minus 12 F.

Torch Cuts Wire Rope

Contributed by H. Josephs

PREPARING lengths of wire-rope for use on crane slings, grab buckets, car hauls and other applications can be done quickly with an acetylene cutting torch. Raveling is prevented by burning off the tar or grease with the cutting blowpipe and then heating the cable six inches on either side of the cut to a cherry red.

When the cable is thus heated, it can be cut almost like a solid block of steel. The cable is not damaged since the temper is removed from only a short distance. If the ends of the wire-rope are cut to a point, they can be laced through sheaved wheels.

Feeder Cuts Overweight Losses

VIBRATORY FEEDERS, hooked in tandem, perform a multiple operation at the Glidden Company's Chemicals, Pigment and Metals Division plant, Hammond, Ind. The first unit feeds lead powder, at a controlled rate, from an overhead hopper. The powder is fed to the second unit equipped with a sealed-end tubular screen. The second unit agitates constantly at top speed to insure uniformity of lead particles.

Feeder unit, left, supplies lead powder to agitator unit then to pail on scale

Both units, manufactured by the Eriez Manufacturing Company, Erie, Pa., are interlocked with an automatic scale. This is arranged so both units feed at maximum rate until nearing a preset amount, then cut back to a dribble and shut off as material in the pail reaches the required weight.

Solve 200-Ton Lifting Problem With Eight Air Operated Screw Jacks

BIGGER AUTOMATED MACHINERY has brought new problems to the plant engineer. Eichleay Corp. faced this problem when it installed a 200-ton crown assembly on top of a 3000-ton capacity transfer press in the McKeesport, Pa., plant of Kelsey-Hayes Company. The Pittsburgh industrial contracting firm used a method which did not interfere with production, was safer and cut one-third off the installation time.

The heavy crown, 10 ft high and wide and 22 ft long, had to be lifted almost 17 ft from the plant floor and lowered on top the press stands. The method developed was built around the use of eight 100-ton air motor screw jacks designed by Duff-Norton Co. of Pittsburgh.

Two jacks were positioned under each corner of the 200-ton crown.

(Continued on page 66)

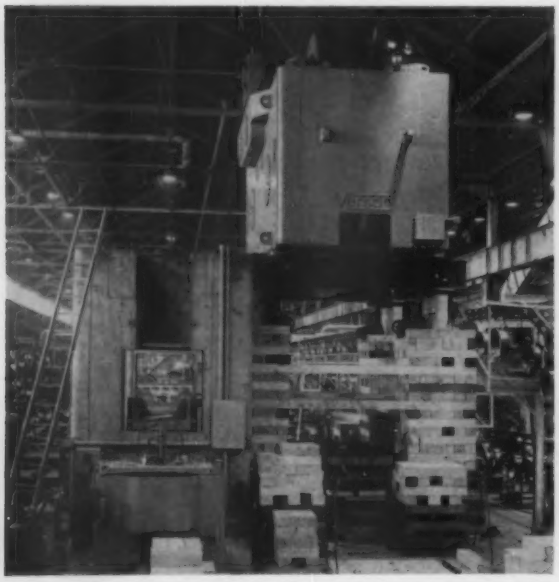


Fig. 1. Crown in position on falsework mounted on rollers about three feet above the floor ready to be pulled into place

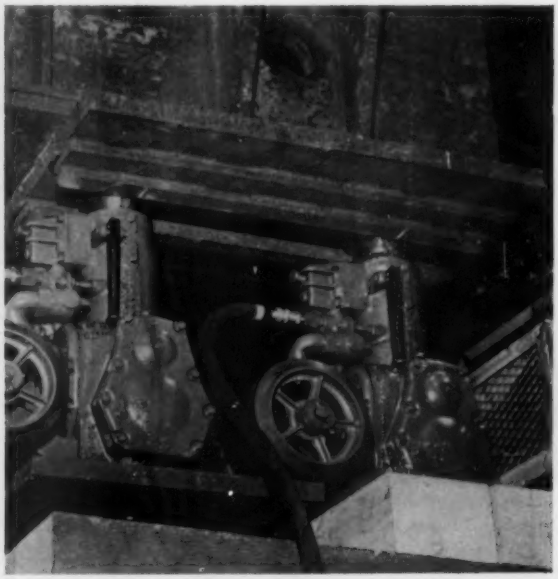
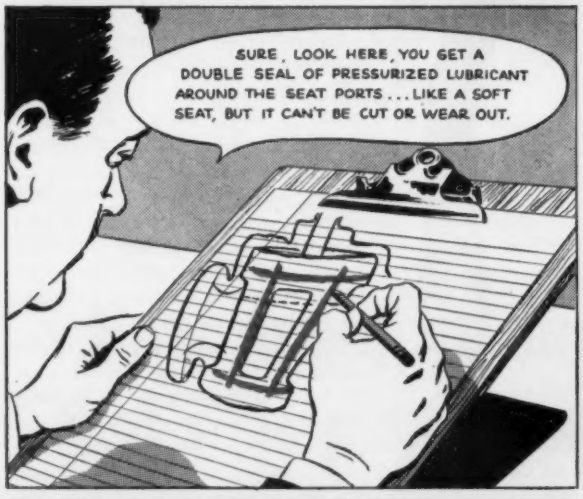


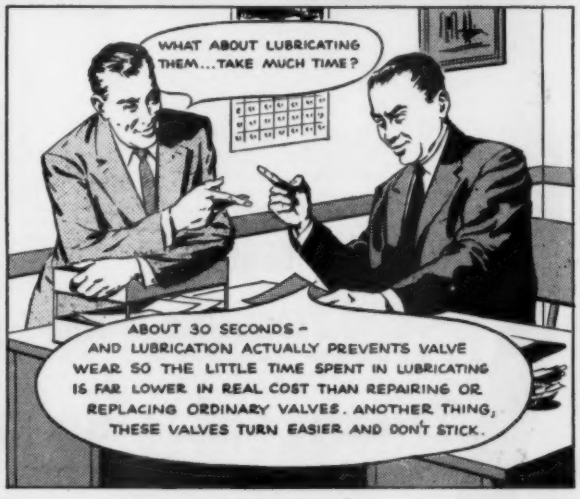
Fig. 2. Two air motor screw jacks under each corner provide the lifting force. Jacks are alternately lifted and blocked

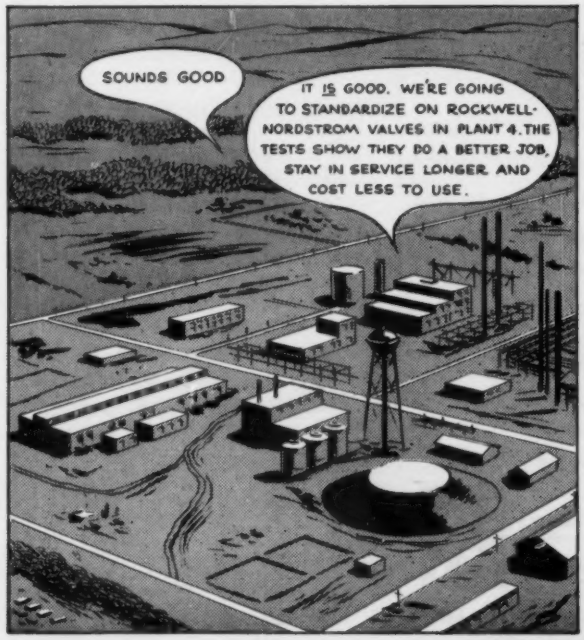
COST CUTTING IN ACTION

by Rockwell-Nordstrom

THE SAFETY ENGINEER SAYS THE FUME LEVEL IS TOO HIGH AGAIN
I'M HAVING VALVE TROUBLE AGAIN. JUST GOT AN O.K. TO REPLACE THEM, THOUGH--FOR THE SECOND TIME IN THREE YEARS.


SURE, LOOK HERE, YOU GET A DOUBLE SEAL OF PRESSURIZED LUBRICANT AROUND THE SEAT PORTS . . . LIKE A SOFT SEAT, BUT IT CAN'T BE CUT OR WEAR OUT.


WHAT ABOUT LUBRICATING THEM...TAKE MUCH TIME?
ABOUT 30 SECONDS - AND LUBRICATION ACTUALLY PREVENTS VALVE WEAR SO THE LITTLE TIME SPENT IN LUBRICATING IS FAR LOWER IN REAL COST THAN REPAIRING OR REPLACING ORDINARY VALVES. ANOTHER THING, THESE VALVES TURN EASIER AND DON'T STICK.


SOUNDS GOOD
IT IS GOOD. WE'RE GOING TO STANDARDIZE ON ROCKWELL-NORDSTROM VALVES IN PLANT 4. THE TESTS SHOW THEY DO A BETTER JOB, STAY IN SERVICE LONGER AND COST LESS TO USE.

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OPERATION—PRODUCTION

(O and P begins on page 62)

Four of the jacks, one under each corner, were raised simultaneously about 14 in. and the other set of four were blocked. The two units were alternately raised and blocked until the crown was eight inches above the 16-ft height of the stands.

A winch was used to pull the crown and falsework, moving on rollers, into place. Then the crown was lowered onto the stands and the falsework removed. The entire job took five days, although the actual jacking required less than 10 hours.

Mechanical screw jacks were used which, once locked into place, will not creep under load. When the full limit of the raise is reached, an automatic shut-off device stops the air motor. A safety keyway in the ram prevents the head from turning and shifting the load.

The jacks require only normal air pressure of 80 to 90 lb to raise capacity loads. A receiver tank from the Kelsey-Hayes plant line with 100 lbs pressure was used to supply air to the jacks.

The crown is tied down to the stand by four nine-ton rods that are 14 in. in diameter and 38 ft long. The rods were sunk through the plant floor into the basement and after the stands were erected and the crown placed into position, the rods were pulled up through the holes to complete the assembly.

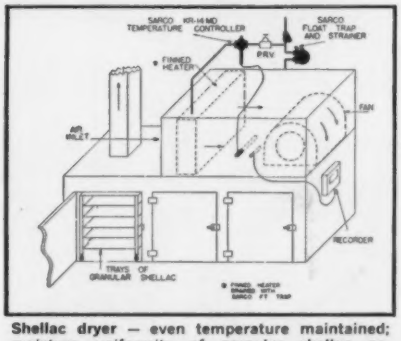
Thread Insert Extends Die Life

DIE HOLDER MAINTENANCE is a costly operation at the Forging and Screw Machine Division of Scovill Manufacturing Company, Waterbury, Conn. The most frequent cause of failure on the die holders was in the tapped holes used to locate and hold down the dies.

Repeated vibration of the large presses would shake the hold-down bolts loose, eventually damaging the threads and allowing the dies to move out of alignment.

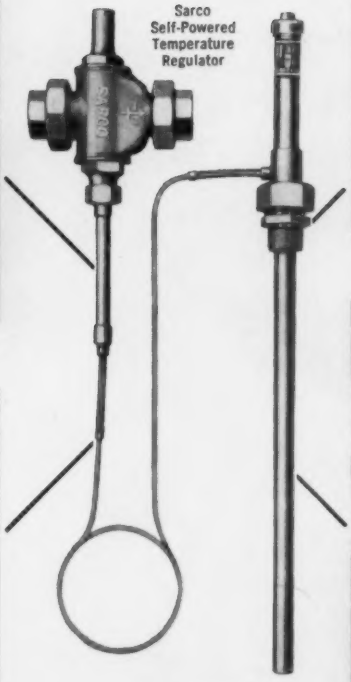
To reduce maintenance costs and extend die holder life, Heli-Coil wire thread inserts are now fitted into all the threaded holes. The holes are drilled with a 25/32 drill and tapped with a special ¾-10 Heli-

Water storage tanks — Sarco self-powered temperature controls on service water storage tanks from twin heaters.



Shellac dryer — even temperature maintained; moisture uniformity of granular shellac accurately controlled — by Sarco self-powered temperature control.

Sarco Self-Powered Temperature Regulator



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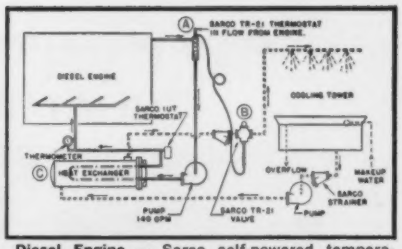
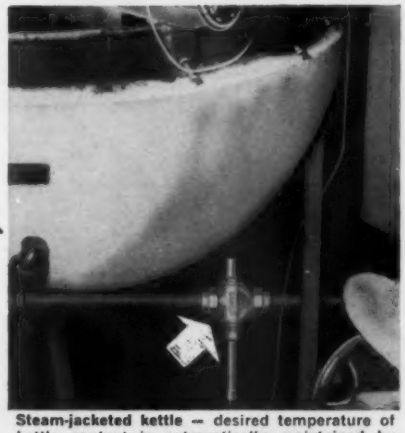


Diesel Engine — Sarco self-powered temperature controller used on diesel engine cooling system. Also ideal for compressors.



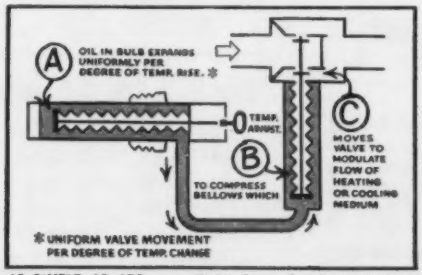
Steam-jacketed kettle — desired temperature of kettle content is automatically maintained by Sarco self-powered temperature control. Steam waste, uncertainty of manual control eliminated.

How to get Automatic Temp. Control that's simple, dependable, inexpensive

HERE'S the way to get rid of uncertain, time-wasting manual temperature control . . . *throughout* your plant. And without investing in complicated, costly temperature control equipment.

These SELF-POWERED Sarco controls are inexpensive, simple, dependable, accurate. They can be used for 85% of your jobs. ½" size costs only about $100!

Thousands of these Sarco controls are giving dependable, accurate service for firms such as Colgate-Palmolive Co., Sinclair Refining Co., Swift and Co.


A
OIL IN BULB EXPANDS UNIFORMLY PER DEGREE OF TEMP. RISE. *
TEMP. ADJUST.
B
TO COMPRESS BELLOWS WHICH
C
MOVES VALVE TO MODULATE FLOW OF HEATING OR COOLING MEDIUM
* UNIFORM VALVE MOVEMENT PER DEGREE OF TEMP. CHANGE

AS SIMPLE AS ABC . . . that's Sarco Self-Powered Temperature Control. A thermostat with capillary tubing and a valve . . . that's all there is to it!

SARCO SELF-POWERED TEMPERATURE CONTROLLERS
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We've been asked...

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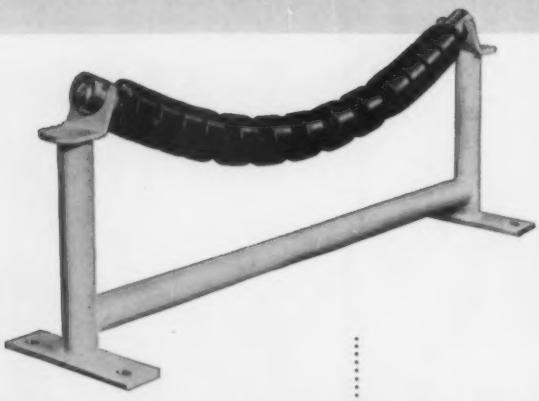
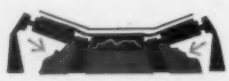
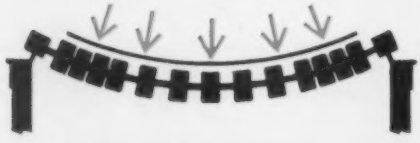


JOY LIMBEROLLER BELT CONVEYOR IDLER

CONVENTIONAL IDLER



Radically different from all other idlers, the Limberoller is a flexible steel cable suspended between two bearings... to which neoprene discs are molded ... forming a single roll idler which turns on its own axis. This imparts a flexing action which is self-cleaning ... prevents material buildup, a source of trouble with conventional idlers.



Supports the belt throughout its entire width... doesn't have the unsupported gaps left between the rolls like conventional idlers. Increases belt life 20% and more. Materials don't "bump along" from idler to idler, either.

Two bearings, instead of six. They are up out of the dirt zone, not hiding down under the belt. Joy has never replaced a single bearing due to normal failure. Heard enough? There's more ... get the whole story from ***Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa.*** In Canada: *Joy Manufacturing Company (Canada) Limited, Galt, Ontario.*

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OPERATION—PRODUCTION

(O and P begins on page 62)

Reduced maintenance of thread inserts resulted in placing them in all holes

Coil tap. Thread inserts of the same size are installed with inserting tools.

The thread inserts can withstand 30 per cent higher loads and the life of the die holders has been extended from one month to seven months.

$10.00 Reward

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PLANT ENGINEERING will pay $10.00 minimum for each item accepted for publication. These items should describe a useful improvement or modification to plant equipment and buildings or more efficient use of any facilities. Where applicable, items should be accompanied by a sketch and/or a photograph. Send all entries to Editor, PLANT ENGINEERING, 308 East James Street, Barrington, Illinois.

Shop-Built Saw Cuts Inventory

CUTTING METAL SLABS up to five inches thick, a traversing circular saw is saving both time and money for the Temco Aircraft Corporation, Dallas, Texas. Designed by Mr. F. Williams, Foreman of Tooling Materials, the saw is a good example of work simplification.

Up until a year ago, Temco either

FROM START TO FINISH **BUILT BY LURIA**

fast, low-cost plant construction gives Youngstown Steel Door Company extra space for expanded production

Making steel sides and doors for freight cars is a job that needs elbow room—and plenty of it. That's the problem that faced top management of the Youngstown Steel Door Company in building a new addition to their plant at Youngstown, Ohio.

Luria Engineering Company was the logical choice. And Luria's reputation for cost-saving methods assured construction at a competitive price.

Luria designs, fabricates and constructs with all responsibility, from start to finish, centered in one competent organization. Standardized designs, structural units and methods of construction, modified to suit individual requirements and often incorporated into highly customized buildings, provide many short cuts that save time and money.

Luria builds anywhere. District offices and representatives in strategically located centers give on-the-spot service. For quick help on your building problems, call Luria in any of the offices listed below.

This 86′ x 520′ clear-span crane building gives plenty of space for production of freight car sides and doors. "Complete satisfaction with both Luria methods and the building produced," is the report of the Youngstown Steel Door Company.

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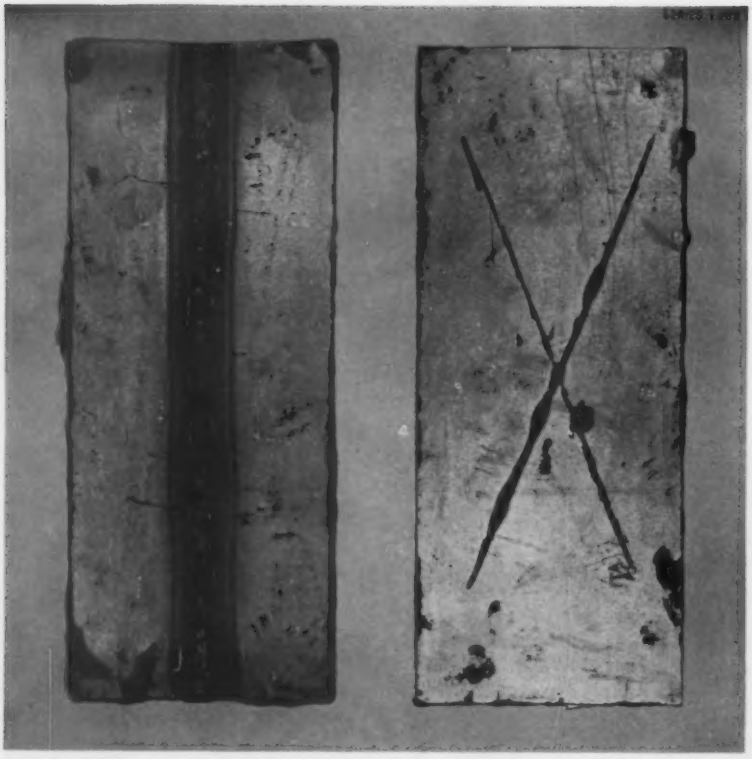

CORROSION'S FOCAL POINTS are easy to detect with a new Amercoat testing method using iron and caustic indicators in a saline gelatin bath. On the welded and scored steel panels shown above after test, unworked surface areas turned red to indicate cathodic properties; but the weld, scores and edges turned blue (here shown blackened) to reveal themselves as anodic corrosion breeders. Rivets, threads, crevices and abrasions also show anodic under test. Unless such areas are effectively sealed from moisture, oxygen and ions they will erupt as focal points of corrosion cells.

How to protect "trouble spots" against corrosion

Ask a corrosion engineer where metal corrosion is likely to attack first. Chances are that he will name rivets, threads, sharp edges, angles, crevices and welds. These are the areas of stress concentration, work hardness, fissures and abrasions. They tend to be anodic and actually breed corrosion. And although they warrant increased protection, conventional coatings pull away from their sharp profiles and leave them inadequately covered.

Amercoat No. 87, a true vinyl mastic, protects these spots in a single coat 10 mils thick, whereas other coatings fail to build 5 mils in three coats. It cuts maintenance painting costs up to 50% because you don't have to re-erect staging and scaffolds for additional coats, and you get results that last.

No. 87 combines the time-tested chemical and weather resistance of vinyl coatings with the thickness of mastic, yet it is easily sprayed with standard equipment over a suitable primer. Available in white, gray, black and aluminum. Use it for enduring protection at lower cost per square foot per year. Complete details mailed on request.—Amercoat Corp., South Gate, Calif.

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For more facts circle 548 on Reply Card

OPERATION—PRODUCTION

(O and P begins on page 62)

stocked aluminum and magnesium bars or cut them from plates on a band saw. The latter required three men to handle the slabs. Band sawing left a ragged edge which had to be milled to obtain a true surface. This additional operation consumed time and wasted metal.

With the new saw, slabs are clamped to the table and the tra-

Fig. 1. Saw is pulled through aluminum slab by chain on far side of table

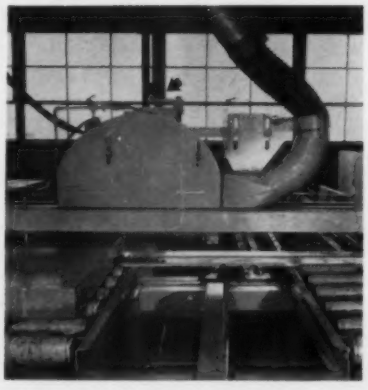

Fig. 2. Handle, arrow, adjusts saw for depth of cut. Guard is also adjustable

versing saw cuts bars up to five inches thick with smooth edges. One operator is needed in place of three and waste material has been reduced. The saw is also used to shape plates for skin mills eliminating an expensive planer operation.

The saw was fabricated mainly from materials found in the shop. Crate conveyors found in the salvage yard provided the rollers needed to support the slab. These

Magnificent

any way you look at it!

Modine Gas Unit Heaters are years ahead in styling

Yes, the Magnificent Modine offers everything you could hope to find in a gas unit heater—superb styling, sturdy construction, unbeatable performance.

Advanced-design features such as stainless steel burners and stainless or aluminized steel heat exchangers and direct-fired tubes assure quick heat . . . long-lasting, economical service. And Modines are up to 50% lighter . . . cost less to ship and install.

Eight sizes are available from 25,000 to 310,000 Btu, the largest model often replacing two smaller units with consequent savings. For natural, mixed, LP and LP-air gas mixtures.

FAST, UNIFORM HEAT — Direct firing of each heat exchanger tube assures quick, uniform heat distribution.

TROUBLE-FREE OPERATION — Large, knife-sharp stainless steel ports resist lodging of dirt and scale.

IMPROVED COMBUSTION — Hooded combustion air inlets directly below each burner improve efficiency . . . minimize flame disturbance.

Complete details are contained in Bulletin 656-A. Get your copy by calling the Modine representative listed in your classified phone book or write Modine Mfg. Co., 1563 De-Koven Ave., Racine, Wis.

GU-1344

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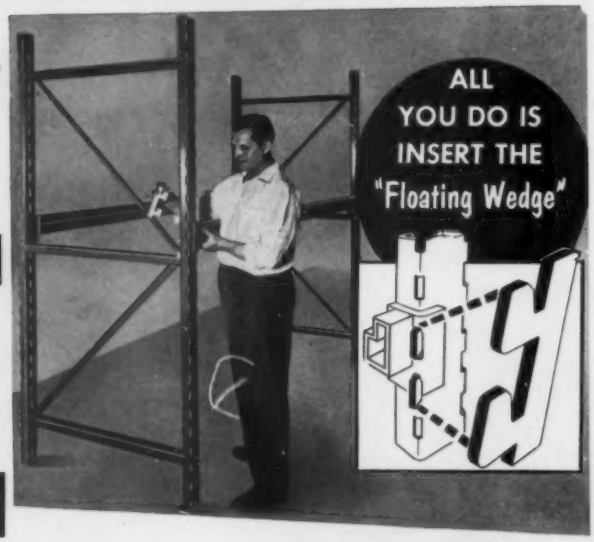

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Sturdi-Bilt's prefabricated factory welded components let you set up your storage with tested, predetermined, controlled load factors. The human element is eliminated — there is no risk of labor variations during field assembly. Write for Sturdi-Bilt's special "Load Chart" and complete details.

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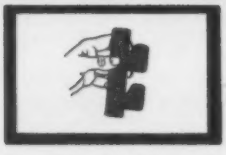
Only 3 BASIC PARTS with patented "Float Wedge Construction" mean FASTEST INSTALLATION - EASIEST ADJUSTABILITY



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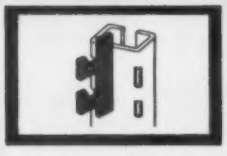

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OPERATION — PRODUCTION

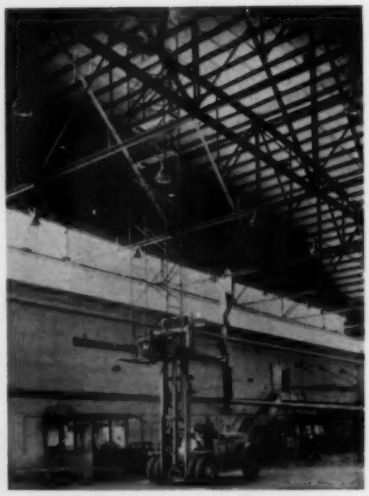
(O and P begins on page 62)

rollers were spaced so that a fork-lift truck can load the slab on to the table. Quick-fastening clamps were installed to hold the slab securely while sawing.

Only the rail and the saw head were purchased. A 20 in., 9 gage, 40 teeth, style 3MR, Simmons carbide tipped blade is used and has proven very successful.

High Welder Rig Saves $2500

MOBILE WORK PLATFORM made by installing a simple scaffold on the forks of a heavy-duty lift truck, eliminated the use of ladders and

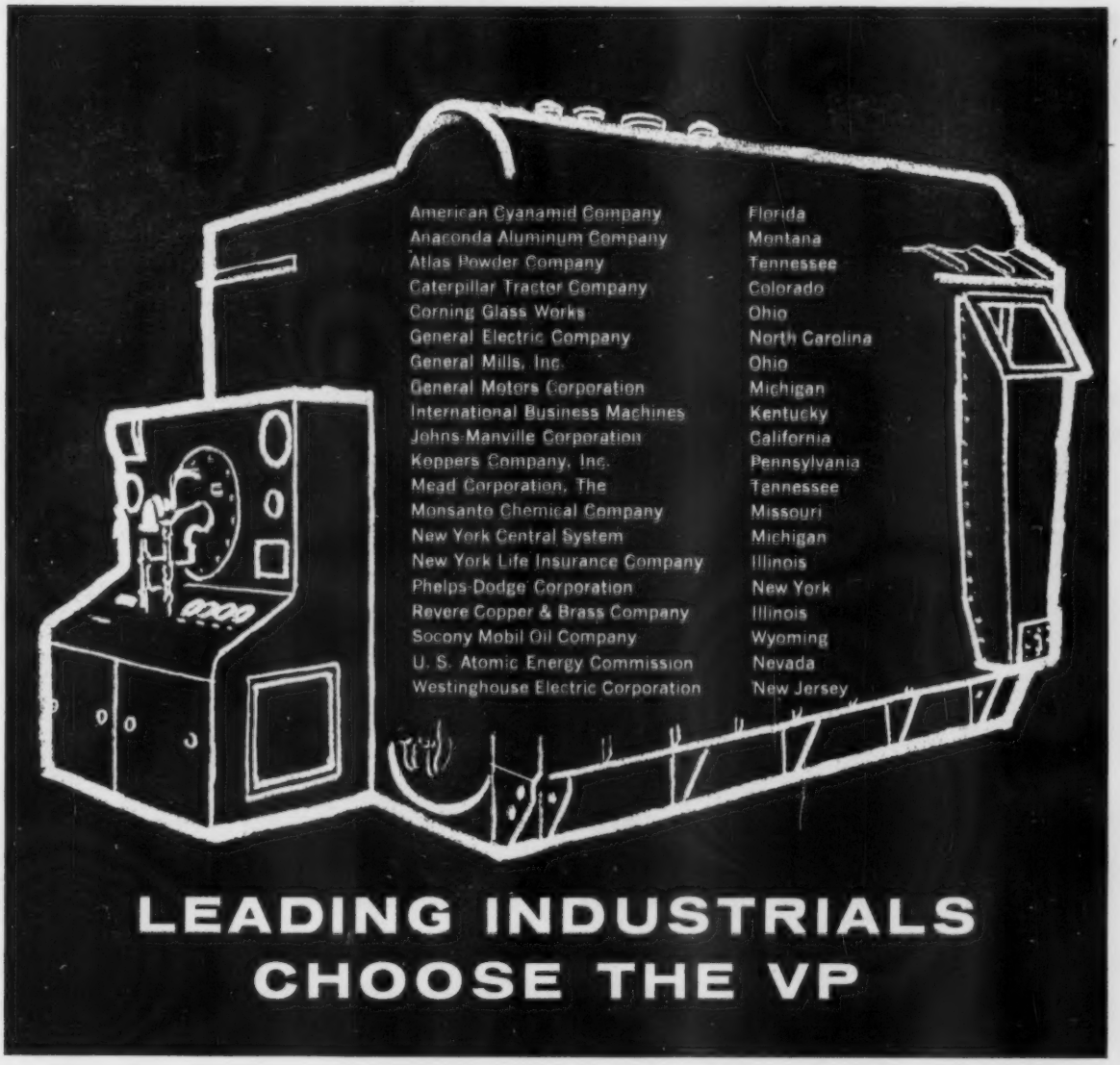


Welder working on girder at 45-ft level while assistant operates fork truck

rigging to save one month of labor and $2500 on a welding job in a Braniff Airlines hanger in Minneapolis.

The job called for rewelding steel girders supporting the 45-ft ceiling. The 29-ft scaffold was mounted on a Clark fork truck with a lifting height of 16 ft. With the forks fully extended, the two-man crew on the scaffold can reach the highest part of the ceiling.

An electric welder was installed on the forks, between the legs of the scaffold, to keep welding lines off the floor. When moving from one area to another, the scaffold is dropped to floor level to clear the bottom girder.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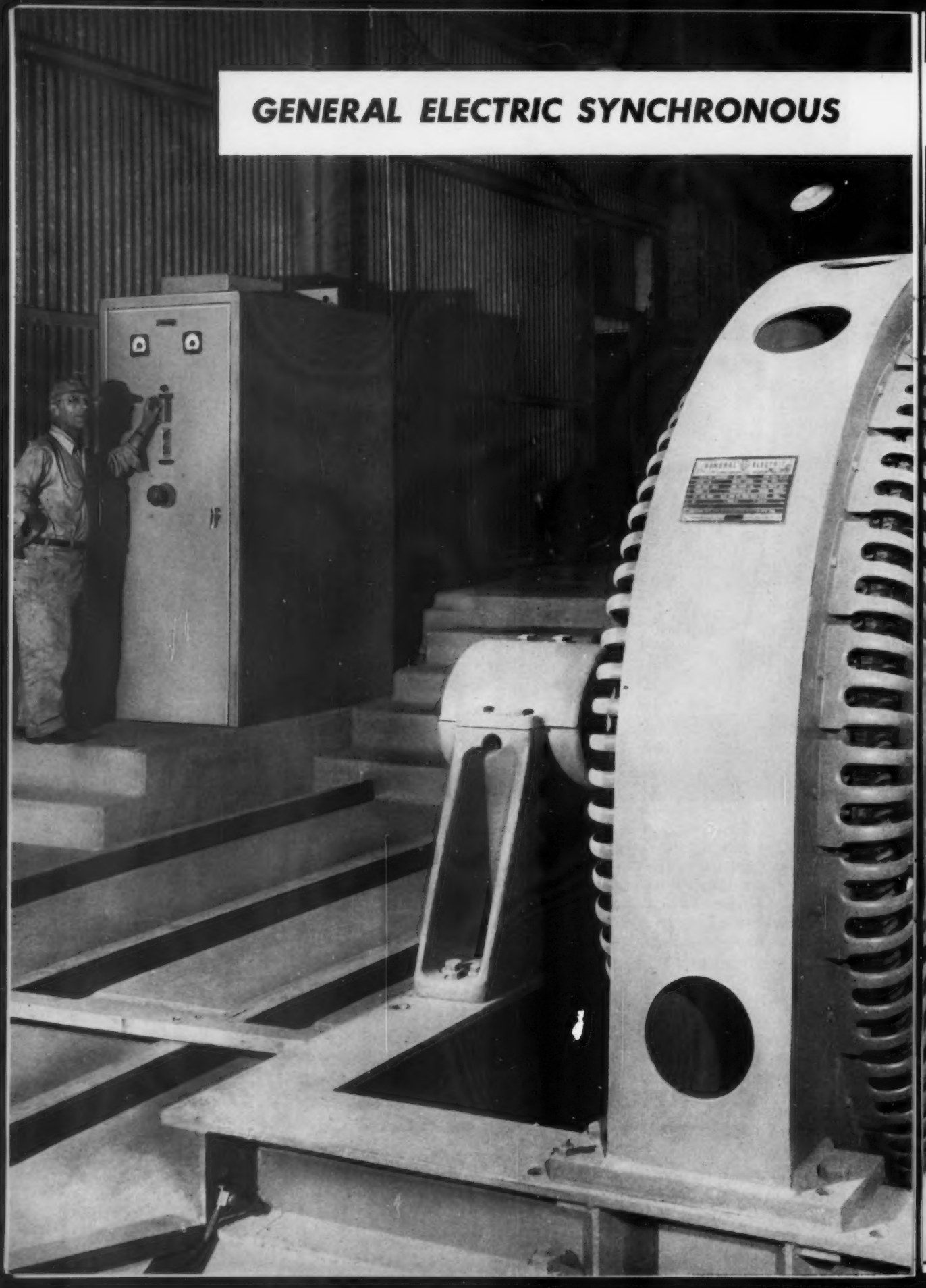
GENERAL ELECTRIC SYNCHRONOUS



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Another reason you can start and synchronize greater loads is because G-E controls allow more time for the motor to bring the load up to synchronizing speed—without unnecessary tripping. While some controls operate on a pre-determined acceleration time, G-E controls use a thermal relay to control the motor during starting. This allows the motor to accelerate heavier loads.

MAXIMUM DRIVE PROTECTION

After the load is synchronized—Should the motor be pulled out of synchronism, G-E controls will remove the field excitation within *1/120 of a second**! This "split-second" field-removal system virtually eliminates the possibility of damage to synchronous motor drives resulting from the motor pulling out of step.

During acceleration—Your motor is constantly protected against overheating by General Electric's graduated protection system—a system controlled by the heating characteristics of the motor—not by a set time period.

Get maximum utilization and protection of your synchronous motors . . . specify the control that gives you all the "extras" as standard equipment: General Electric synchronous motor control. For more information, contact your G-E Apparatus Sales Office, or write for GEA-5873, to Section 783-7, General Electric Co., Schenectady, N. Y.

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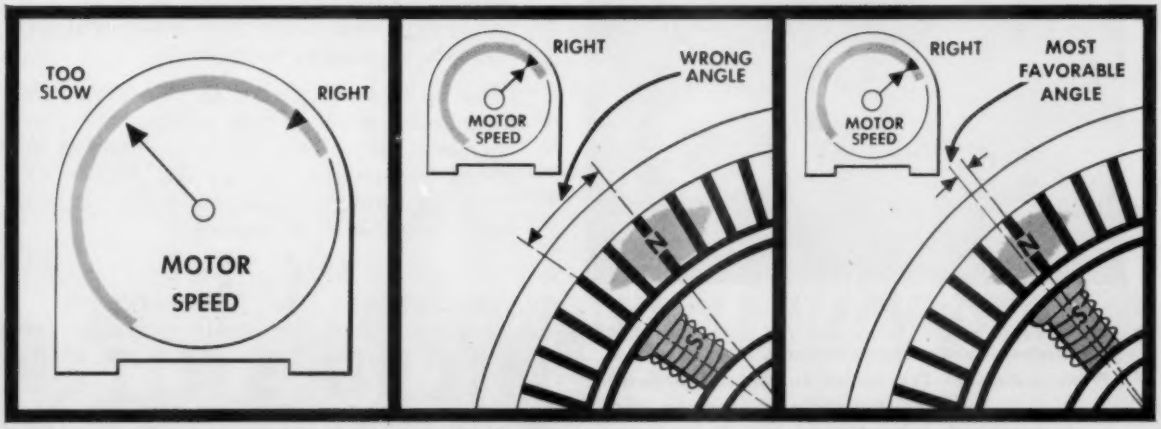
*Based on 60-cycle power source.

GENERAL ELECTRIC

PRECISION ANGLE SWITCHING



MOTOR SPEED is measured by field-application relay to determine best possible speed for synchronizing.

LOAD ANGLE must also reach a point of maximum flux between rotor and stator poles to give positive synchronization.

BOTH SPEED AND ANGLE must be correct before control applies field, to provide full use of motor's pull-in ability.

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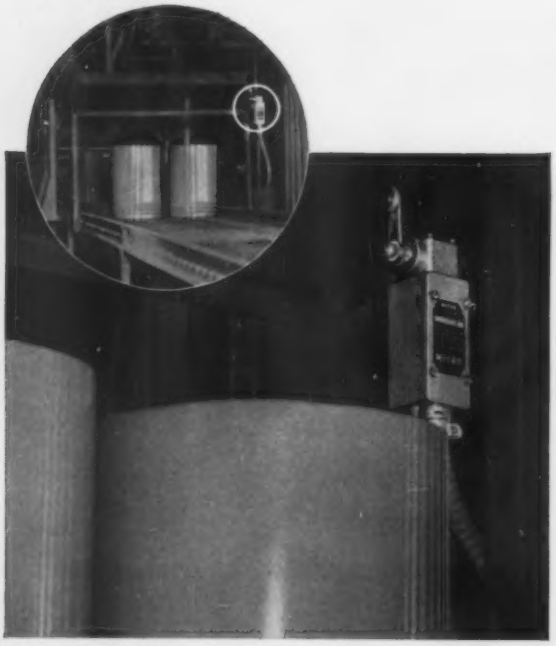
Switch stops overhead conveyor if parts fail to transfer

This overhead conveyor carries cans through a drying oven. The angle increases as it meets the roller conveyor, so the painted cans slide off of the hangers and on to the rollers. If cans fail to detach, they contact a hinged barrier which actuates the switch and stops the conveyor.

Close-up shows heavy duty Type ML switch which will handle up to 1½ H.P. at 220 vac. The roller lever actuator is adjustable through 360 degrees, positively locking in any position. The entire head assembly can be faced to any of four positions.



How two switches speed a carton stapling operation

As the operator slides the box into position under the stapler, it slides over Switch A. The switch operates to start the conveyor motor just enough to bring the next box into reach. When the carton is in position for stapling, it actuates Switch B (beneath the metal plate). This causes the two guide rails to converge on the carton and guide it in a straight line through the stapling operation.

Close-up shows Switch A, an adjustable roller lever switch which is very popular with plant engineers. It is very versatile—may be adjusted horizontally through 360 degrees and vertically through 225 degrees, positively locking at intervals of .12 degrees.

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UNITED STATES STEEL

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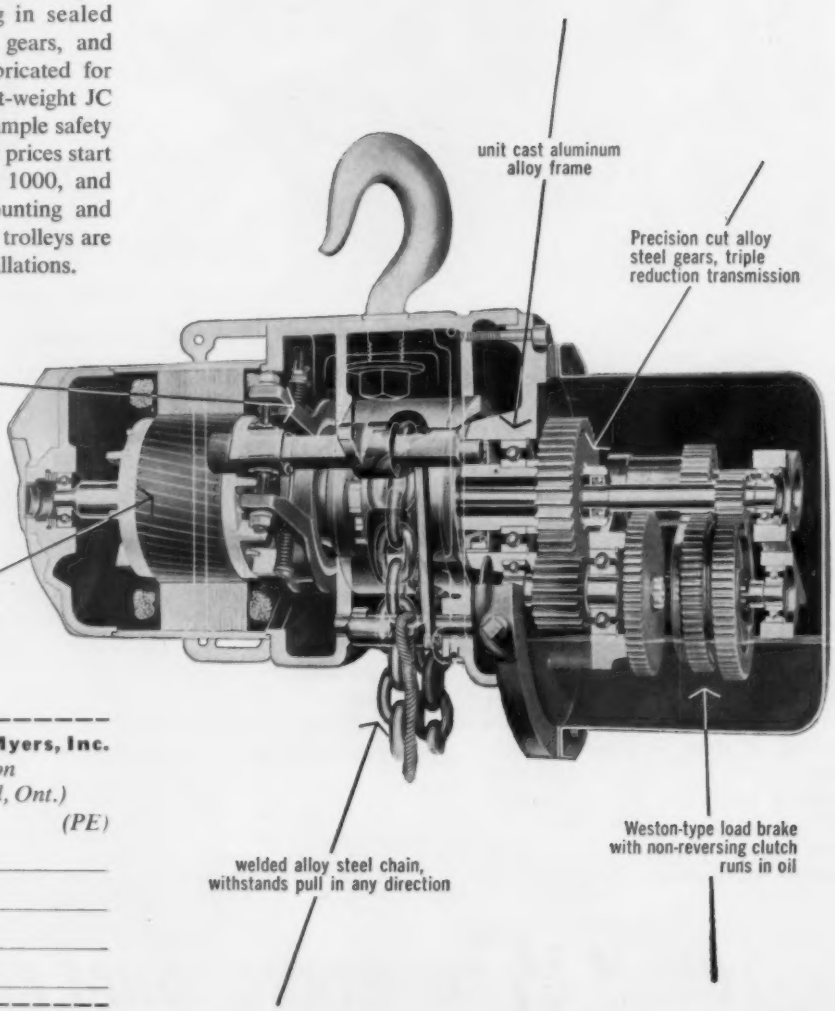
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CONSTRUCTION BRIEFS — a review of fundamentals for the plant engineer

Prepared by B. A. Wasil, Structural Engineer

DESIGNING IN REINFORCED CONCRETE PART I

THIS BRIEF, and several to follow, will comprise a series concerning the design of reinforced concrete. The basic principles and formulas of reinforced concrete will first be developed, then the design of such structural items as slabs, rectangular and tee-beams, columns, walls and footings will be discussed. However, before a study in reinforced concrete is attempted, it is advisable to have some knowledge of the material and how it is mixed to give required strength and durability properties.

Portland cement concrete contains a cementing agent made up of Portland cement and water and inert materials, usually sand and gravel or sand and crushed stone. The inert materials, called aggregate, are divided between fine and coarse aggregate by the #4 sieve. The problem of determining—for a specific set of conditions — the proportions of the cement, water, fine and coarse aggregate is known as *design of a concrete mix*. Each of the materials for concrete plays an important and necessary role in the production of the final product.

Cement. Cement has been referred to as the living tissue of concrete. It is the binding material. When mixed with water, it will combine chemically to form a paste that will hydrate, binding the inert materials together into a hardened mass. Its cementing action is, of course, the prime purpose of cement; however, cement plays an important secondary role as a lubricant in concrete.

The proportions of the various raw materials that go into the manufacture of Portland cement, the heat of the critical stage of the burning kiln, the time the material is allowed to remain at this temperature, the degree of fineness the cement is milled — all control the chemical composition and physical properties of the cement. Such variations are recognized by the A.S.T.M. and Federal Specifications, in listing five types of cement.

Type I Standard or Normal
II Modified or Moderate Heat
III High-Early Strength
IV Low Heat
V Sulfate Resistant

The names of the types describe adequately the principal physical property that distinguishes each type of cement.

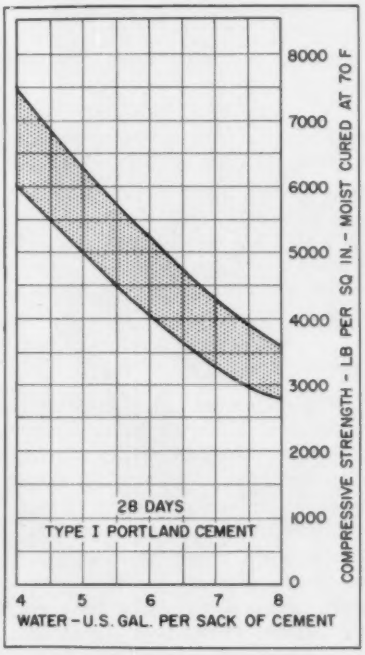

Fig. 1. Relation between 28-day compressive strength and water-cement ratio

Type III, high-early strength cement was developed for the purpose of speeding up construction work, releasing forms more quickly, and reducing the time required to cure and protect concrete. However, high-early strength cement releases a high heat in the chemical process of hydration and is not satisfactory for massive structures.

In thin wall structures, the heat of hydration is easily dissipated. In massive structures, such as dams, high heat may remain in the interior of the structure long after the surface of the structure has hardened. The interior of the structure will contract as it cools, thus causing cracks and spalling in the structure. For this reason, it becomes necessary to develop a cement that would release a lower amount of heat, to be used in massive structures. Moderate-heat cement, Type II, was developed as an all-purpose cement, while low-heat cement, Type IV, was developed primarily for very large dams.

It was found that sulfate salts in solution are detrimental to cements of the types I, III & IV. For this reason a sulfate resistant cement, Type V, was developed to be used for structures in contact with sea water and alkali soils. Type II is also used to protect against less severe sulfate action.

Water. In order for cement to hydrate and cure, it must have an excess of water. The purpose of water is to form the paste, but again, water plays the secondary role of lubricant. As long as the water used is palatable, it cannot have enough impurities to disturb the properties of the concrete.

Aggregate. The aggregate is the concrete. It makes up 75 per cent or more of the total weight of concrete and thus the properties of

Table I. Required sieve analysis for fine aggregate. (From ASTM C33-54T)

Sieve	Percentage Passing
3/8-in	100
No. 4 (4760 micron)	95 to 100
No. 8 (2380 micron)	80 to 100
No. 16 (1190 micron)	50 to 85
No. 30 (590 micron)	25 to 60
No. 50 (297 micron)	10 to 30
No. 100 (149 micron)	2 to 10

Table II. Required sieve analysis for coarse aggregate. (From ASTM C33-54T)

Sieve	1½" Max. size Percentage passing	¾" Max. size Percentage passing
1½"	95-100	.....
3/4"	35- 70	90-100
3/8"	10- 30	20- 55
No. 4 (4760 micron)	0- 5	0- 10
No. 8 (2380 micron)	.....	0- 5

Table III. Water-cement ratios recommended for various construction types, structure locations, and exposure conditions

Type or location of structure	Severe or moderate climate, wide range of temperature, rain, and long freezing spells or frequent freezing and thawing. gal/sack			Mild climate, rain or semi-arid; rarely snow or frost. gal/sack		
	Thin sections	Moderate sections	Mass sections	Thin sections	Moderate sections	Mass sections
A. At the water line in hydraulic or waterfront structures or portions of such structures where complete saturation or intermittent saturation is possible, but not where the structure is continuously submerged in water	5	5½	6	5	5½	6
B. Portions of hydraulic or waterfront structures some distance from water line, but subject to frequent wetting by water	5½	6	6	5½	6½	7
C. Ordinary exposed structures, buildings and portions of bridges not coming under above groups	6	6½	7	6	7	7½
D. Complete continuous submergence in water	6	6½	7	6	6½	7
E. Concrete deposited through water	*	5½	5½	*	5½	5½
F. Pavement slabs directly on ground.						
Wearing slabs	5½	*	*	6	*	*
Base slabs	6½	*	*	7	*	*

G. Special case: For concrete not exposed to the weather, such as interiors of buildings and portions of structures entirely below ground, no exposure hazard is involved and the water-cement ratio should be selected on the basis of strength and workability requirements.

*These sections not practicable for the purpose intended.

the aggregate to a very large extent control the same properties of the concrete. The properties of weight, strength, elasticity, heat resistance, thermal conductivity, and durability of the aggregate affect the same properties of the concrete. Properties of the aggregate, other than the above, that will affect the quality of the concrete are:

(1) Quality
(2) Shape
(3) Gradation

The quality refers to cleanliness and strength. The aggregate should consist of clean, hard, strong and durable particles free of chemicals or coatings of clay or other fine material which will effect the bond to the cement paste.

The shape of the coarse aggregate depends a great deal upon its source. If it is a natural source such as gravel, the particles will be rounded due to weathering, and made up of rock of a variety of geological origins. Aggregate particles obtained by crushing rock are angular in shape and of the same geological background. Rounded aggregate makes for more workable concrete but care must be taken that the particles are not too slick, thus preventing good bond with a cement paste. Angular aggregate bonds well but makes harsher concrete and requires a greater cement demand to cover a given surface area.

Since the job of the cement paste is to add strength by just binding the aggregate together, most economical, more durable and stronger concrete is developed by having aggregate graded such that a minimum proportion of voids in the aggregate is obtained.

Reasonable approximation to a good gradation is maintained by complying with A.S.T.M. requirements for gradation shown in Tables I & II.

A measure of the fineness of sand can be given by the value of fineness modulus, which is defined as the sum of cumulative percentages retained on the No. 4, No. 8, No. 16, No. 30, No. 50 and No. 100 sieve, divided by 100.

The per cent retained is the complement of the per cent passing. The larger the fineness modulus the more coarse the sand.

Water-cement ratio theory. It takes about 2½ to 3 gallons of water to combine chemically with one bag of cement (94 lb). Any additional water is known as "water of convenience" and is used as a lubricant to allow easier workability and to assure that all particles of cement have water available for chemical action. It has been shown that any additional water will detract from the strength of the mix. Figure I shows this relationship for Type I cement after 28 days.

The uncombined water will evaporate off and create capillary tubes or be held captured in small pockets of water in the concrete. When water gets into the capillary tubes and then freezes, it will enlarge the openings. Captured water, when frozen, will also create structural disturbances in the concrete. It has thus been found that the durability of concrete, as measured by the number of cycles of freezing and thawing it can withstand, is also dependent upon the water-cement ratio. Table III shows recommended values of water-cement ratio for various types of construction and exposure.

Workability. The workability of concrete, as measured by the slump test, is a very important construction consideration. A concrete that flows easily is necessary for placement into thin walls that are heavily reinforced. On the other hand a pavement does not introduce any major placement problem and a stiff mix is just as suitable. Table IV shows recommended slump for various types of construction.

Maximum size of coarse aggregate. The maximum size of the coarse aggregate used will depend upon size and shape of the members and the spacing of the reinforcement bars. In general, the maximum size need not exceed 1/5 the least dimension of the member nor ¾ the clear spacing between reinforcing bars. The larger the maximum size aggregate the less the surface area of aggregate per given volume. Thus the proportion of aggregate to total concrete increases with maximum size and the cost of concrete decreases. The coarse aggregate should then be graded up to the largest size practical for the job.

Table IV. Recommended limiting values of slump for various types of concrete

Type of construction	Slump in inches	
	Maximum	Minimum
Reinforced foundation walls and footings	5	2
Plain footings, caissons and substructure walls	4	1
Slabs, beams and reinforced walls	6	3
Building columns	6	3
Pavements	3	2
Heavy mass construction	3	1

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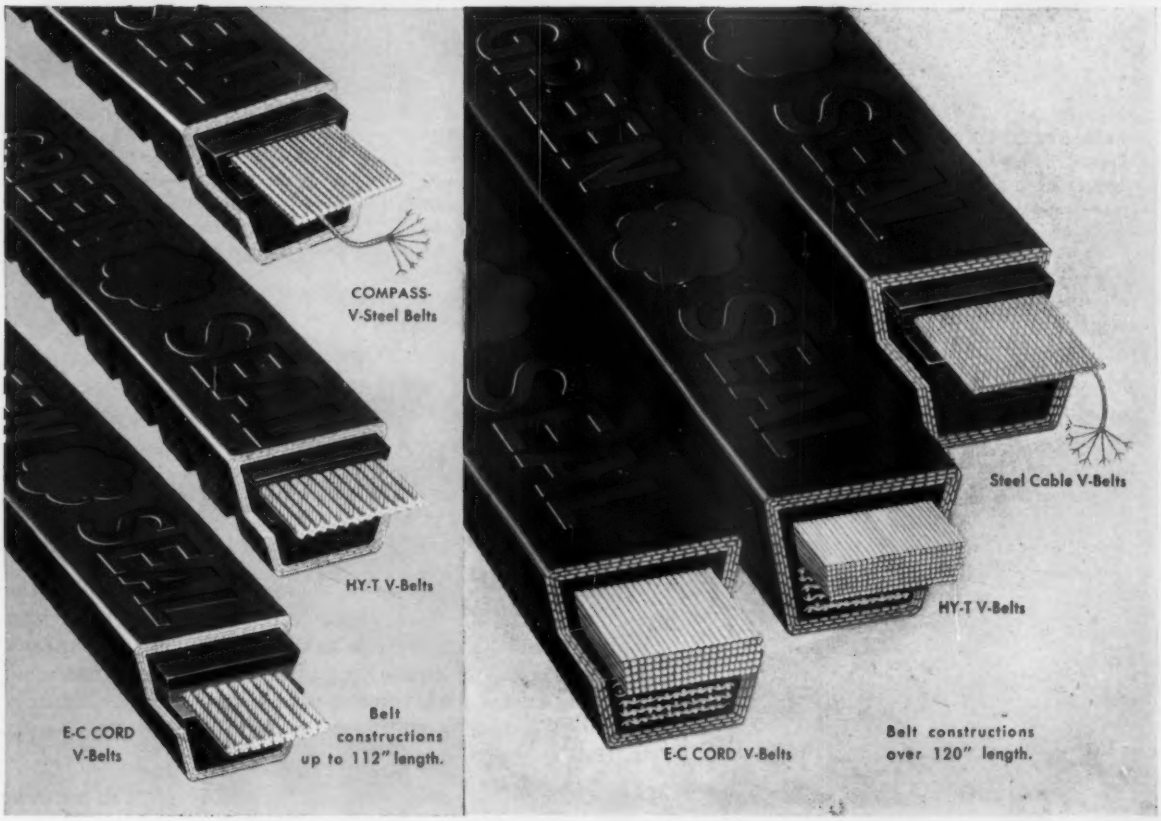

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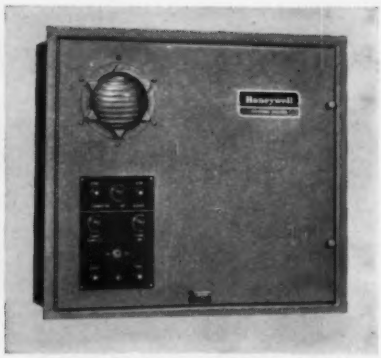

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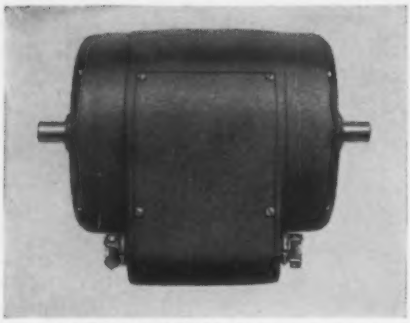

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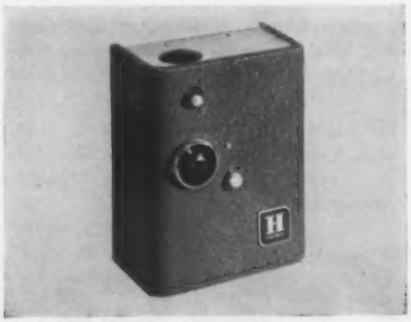

ALARM SILENCING RELAYS permit an alarm to be silenced, and light an integral red light until an unsafe condition has been corrected. Relay automatically resets the alarm when safe conditions are restored.

You don't have to spend a lot of money for dependable automatic controls. Like many manufacturers, you can use various Honeywell industrial controls as the efficient, low-cost means of automating your equipment . . . improving performance . . . increasing safety. And, you can use these inexpensive controls to save time, money and space by extending automation in your plant or process.

There are more than 9000 standard types of Honeywell controls to handle temperature, pressure, liquid level and humidity—for control, switching or safety functions. There are electric, electronic and pneumatic types.

Though they're low in cost, these controls are top-quality, reliable devices. If there's not already a standard control for your particular application, Honeywell can design and build one for you.

Your nearby Honeywell field engineer will be glad to discuss your control requirements. Call him today . . . he's as near as your phone.

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Wagner Sealed Dry-Type Transformers can serve under the most adverse conditions

Impervious to DUST, LINT, HUMIDITY, HIGH AMBIENT TEMPERATURES, FLOODING—no need for vaults or barriers

Here's a unit substation transformer that you can safely install in any load center—any place—no matter how tough the operating condition.

Wagner Sealed Dry-Type Transformers are hermetically sealed in a welded steel case to provide positive protection from contamination, fire and explosion hazards.

Class H insulation is used throughout the transformer. Core and coils are impregnated with silicone varnish and are sealed in the case which contains inert-dry-nitrogen under pressure to prolong insulation life. Maintenance is reduced to periodic checking of bushings case and gas pressure.

Available in ratings from 300 to 2000 kva, 5 or 15 KV high voltage, 480 volts low voltage. For complete information on these sealed dry-type transformers, write for Bulletin TU-214 or call the Wagner branch office near you.

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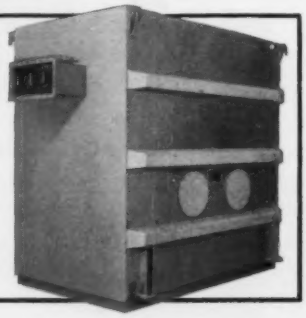
to save you money

Wagner Nitrogen-Filled Dry-Type Transformers save you individual job engineering time and cost. That's because they are PRE-DESIGNED in standard ratings coordinated with the specifications of unit substation switchgear builders. These standard designs assure quicker delivery of the correct transformer for your load center installation.



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Allen-Bradley Line
of MOTOR CONTROL
includes Both!

D.C. **A.C.**

RELAYS AND CONTACTORS

Bulletin 200, Type G Relay. Rated: 5 amp, 64 v; 2 amp, 125 v; 0.5 amp, 250 v.

Bulletin 202 Contactor, Size 2, 1 Pole. Rated: 50 amp, 115-230 v.

D.C. relays are made with up to 8 poles. Also universal types, having contacts changeable from N.O. to N.C.—or vice versa—by merely reconnecting the terminals. Up to and including the 150 ampere rating, D.C. contactors are of the solenoid type; beyond this rating, up to and including 600 amperes, the clapper type construction is used.

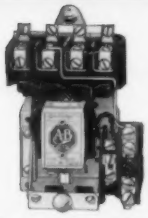
Bulletin 700, Type C. Rated: 10 amp, 550 v max.

Bulletin 702, Size 2, 3 Pole. Rated: 50 amp, 550 v max.

A.C. relays are made in different types for various applications, with up to 8 poles. The universal type, having contacts changeable from N.O. to N.C.—or vice versa—is very popular. The A.C. solenoid contactors, made in 9 ratings up to 900 amp, 550 v max., will satisfy any service requirement. Silver alloy contacts are used throughout the D.C.-A.C. solenoid relay and contactor lines.

ACROSS-THE-LINE STARTERS

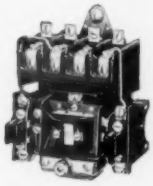
Bulletin 600, Form 52, double pole only, open type. Max rating: ¾ hp, 115-230 v.



Bulletin 209, Form 2. Max rating: 1½ hp, 115 v; 2 hp, 230 v.

D.C. manual starters have a rugged, snap action mechanism that prevents contact "teasing" and thus prolongs contact life. D.C. manual and solenoid starters have maintenance free, double break, silver alloy contacts. Motor overload protection is reliable.

Bulletin 600 in general purpose enclosure, complete with reliable overload breaker. Rated: 1 hp, 110-220 v.



Bulletin 709, Size 1. Rated: 7½ hp, 220 v; 10 hp, 440-550 v. Same general construction for max ratings of 300 hp, 220 v; 600 hp, 440-550 v.

All Allen-Bradley A.C. motor control is equipped with silver alloy contacts which are always in good operating condition. Because all A-B solenoid starters have only one moving part, trouble free performance and long life are automatically assured. It is the basic reason for Allen-Bradley's "quality" reputation.

A-B QUALITY

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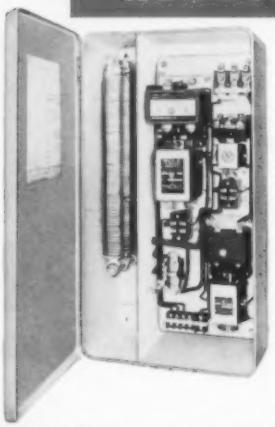
13-57-MR

...and more

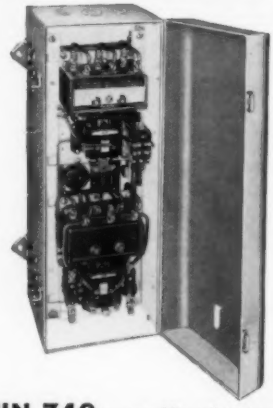
Allen-Bradley MOTOR CONTROL

D.C. | A.C.

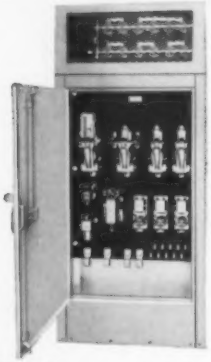
REDUCED VOLTAGE STARTERS



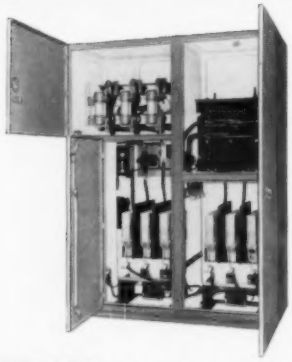
BULLETIN 267 are time limit, resistor type starters for automatic acceleration of constant speed shunt and compound wound D.C. motors. Solenoid contactors used up to and including Size 4 ratings. Max ratings: 75 hp, 115 v; 150 hp, 230 v.



BULLETIN 740 are graphite resistor type starters for automatic acceleration of squirrel cage A.C. motors. Made with 1 or 2 points of acceleration. Can provide velvet smooth acceleration for squirrel cage motors. Max ratings: 200 hp, 220-440-550 v.



BULLETIN 268 are time limit resistor type starters for automatic acceleration of adjustable speed shunt and compound wound D.C. motors. Designed for heavy duty service. Both Bulletin 267 and 268 starters available with or without dynamic braking feature, and also for reversing service. Max ratings: 75 hp, 115 v; 150 hp, 230 v.



BULLETIN 983 high tension starter illustrated above is of the reactor type, intended for starting synchronous motors. Available as an autotransformer reduced voltage starter; also in the across-the-line construction. The heavy duty, solenoid air break contactor assures long, trouble free life. Max ratings: 1500 hp, 2300 v; 2500 hp, 4600 v. at 0.8 P.F.

The Allen-Bradley *quality* line is *not* limited to alternating current motor control. A companion line of direct current motor control is available with the same outstanding *quality* . . . the same reliability . . . the same ability to "take it." Both lines are described and listed in our latest A-B Handy Catalog, and our trained field engineers will also be glad to help you with your control problems.

You cannot make a mistake when you insist on Allen-Bradley control.

A-B QUALITY

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SOLENOID MOTOR CONTROL

QUALITY

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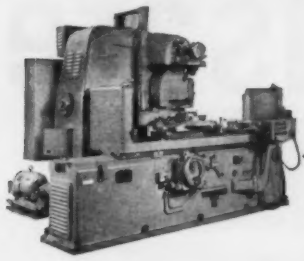
13-57-MR

Thompson Precision Surface Grinder, Type C

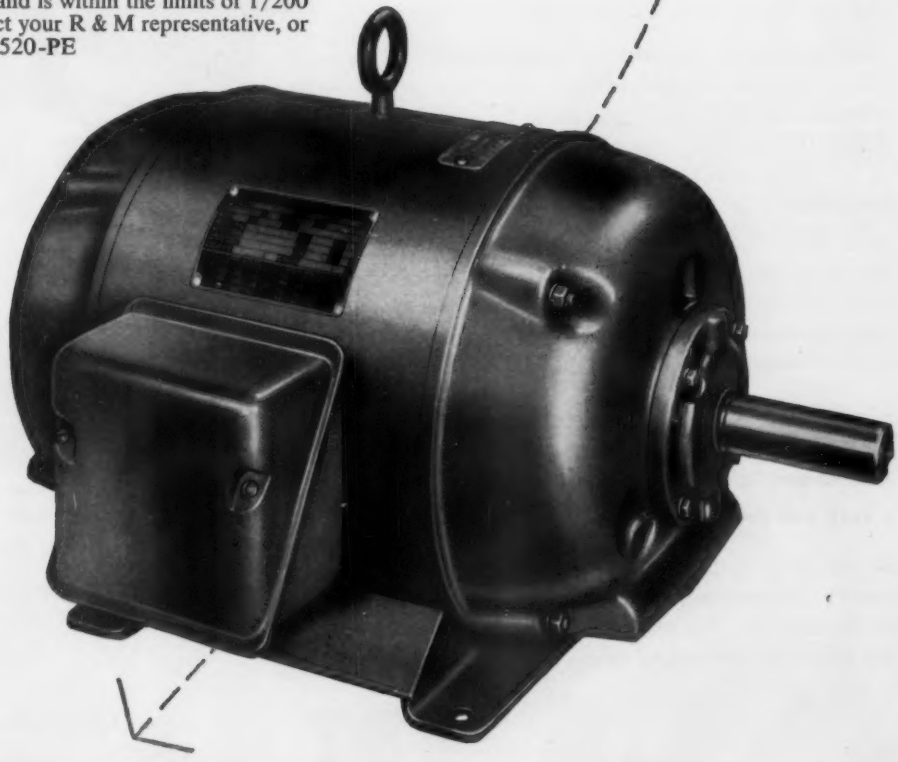


Thompson Grinders are world famous for accuracy. Their precision depends to a great extent, on the smooth running R & M hydraulic pump drive motors and the motor parts in the spindle head. Since even slight vibration in a precision machine tool destroys fine surface finish, Thompson engineers have wisely chosen R & M Motors because of dependability and running smoothness.

Freedom from vibration in a motor depends upon the physical balancing of moving parts and also the elimination of torque impulses set up in the windings. All R & M rotors are balanced to have less than .000025 inches of vibration amplitude and torsional vibration is eliminated by designing the windings for balanced magnetic symmetry.

If your application requires smoothness, dependable performance and is within the limits of 1/200 to 200 H.P. contact your R & M representative, or write for Bulletin 520-PE

motor balance boosts Thompson precision!



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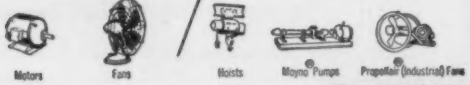

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stop condensate backup

Nicholson steam traps discharge condensate and air from steam lines and equipment *faster* than any other trap of comparable size . . . help you make full use of your steam dollar. The reason—the effective use of a large orifice. A ½" Nicholson trap has a greater discharge capacity than most 1¼" traps . . . and costs less, too!

And that's not all. With just one thermostatically-operated moving part, there's nothing to get out of order, nothing to go wrong. Nicholson means continuous and low-cost operation of your steam-using equipment . . . no downtime from trap failure.

- **powerful valve action . . . no mechanical linkages to cause trouble.**
- **small and lightweight . . . easy to pipe and support.**
- **each unit steam-tested before shipment.**

So, to get a trap that discharges faster, saves money, specify Nicholson. W. H. NICHOLSON AND COMPANY, 14 OREGON ST., WILKES-BARRE, PA. *Sales and Engineering offices in 98 principal cities.*

Write for Bulletin 1055

NICHOLSON
of Wilkes-Barre

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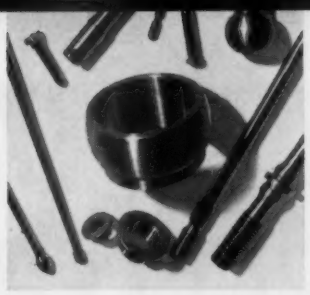
Two case histories

How 2 companies improved production by changing to

STANICUT Cutting Oils



Here are reports on two companies that have recorded (1) increases in production (2) better machine performance (3) longer tool life (4) money saved by switching to a STANICUT *Cutting Oil suited to their operations. You can get similar results.*

Operator George Laverdiere and Standard Oil lubrication engineer, Leland J. Loomis, examine piece just off Cincinnati centerless grinder. Lee Loomis is another man who knows how to advise on metalworking problems. Lee has had ten years' experience in such work, has an engineering degree from Tri-State College and has graduated from the Standard Oil Company's Sales Engineering School.

G. A. Brevik Manufacturing Company uses STANICUT Oil 137 BCS

G. A. Brevik Manufacturing Company, Prescott, Michigan, is the largest producer of carburetor needle valves. The company was blending its cutting fluid from four different oils. Still they experienced tool breakage and ring formation on the surface of the stainless steel they were machining. Then one machine was converted to STANICUT Oil 137 BCS to test the oil's suitability for this operation. Soon all machines were converted.

Production increased 25% because of the improved performance of the machine tool. Cutting oil inventories have been reduced from four different oils to one. Tool life has been extended. There is no variation in fluids as there was when four oils were being blended, and there is no messy blending operation.

STANICUT Oil 137 BCS is ideally suited for severe, high speed machining.

Standard Oil industrial lubrication specialist, Ray Wells, and Stuart Bergsma, G. A. Brevik manager, inspect carburetor needle valve. Ray recommended plant's switch to STANICUT Oil 137 BCS. He is well qualified to make such recommendations. Ray is a graduate of the Illinois Institute of Technology with a degree in engineering, and he has completed the Standard Oil Sales Engineering School. He has been an industrial lubrication specialist at Standard for six years.

Dearborn Centerless Grinding Co. uses STANICUT Oil 126 BCS

Difficult-to-grind stainless steel was the problem at Dearborn Centerless Grinding Company. Wheel loading and wheel break-down were such that soluble type oils weren't satisfactory. For this reason, Dearborn began using STANICUT Oil 126 BCS.

Company management found it secured these six important benefits by changing to STANICUT Oil 126 BCS in grinding operation:

1. Better finishes.
2. More pieces obtained per wheel dress.
3. Superior wheel life obtained on profile jobs.
4. Harder wheels could be used.
5. Finer grit wheels could be used.
6. More stock per pass could be removed.

Get more data on STANICUT Cutting Oils from your Standard Oil industrial lubrication specialist. One of these men is nearby in any of the 15 Midwest and Rocky Mountain states. Or write Standard Oil Company, 910 South Michigan Avenue, Chicago 80, Illinois.

STANDARD

STANDARD OIL COMPANY
(Indiana)

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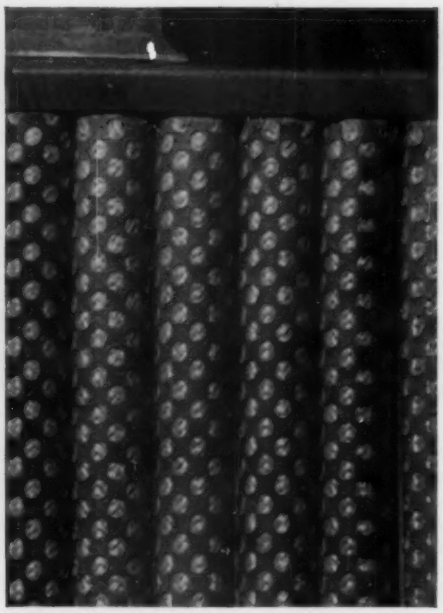
NEW TG EXIDE-IRONCLAD BATTERY SELLING AT RECORD LEVELS

Keeping up with sales. The busy shipping floor at the Exide plant. High volume production insures prompt delivery on all orders.



New tubular construction of positive plate. Holds more active material, gives you highest capacity per cubic inch of any industrial truck battery.

Electric industrial truck users buying it up for "greater economy" and "more power" advantages

Introduced only last April, the new TG Exide-Ironclad Battery is already selling at a faster rate than previous model Exides ever did in a similar period. Indications are that it is on its way to being the biggest selling electric industrial truck battery in history.

Experienced electric industrial truck users are the major buyers —the men who know batteries and see in the TG more value for their money. But in addition, there are truck users who are switching to this TG Exide-Ironclad Battery from cheaper but less economical makes.

If you want maximum economy and better performance in the operation of your electric industrial trucks, get the new TG Exide-Ironclad Battery. You can have more capacity in the same size or the same capacity in a smaller size at a lower cost. Call your nearby Exide representative. Or write for detailed bulletin. Exide Industrial Division, The Electric Storage Battery Company, Philadelphia 2, Pa.

For more facts circle 564 on Reply Card

Exide®

The Electric Storage Battery Company

DROP FORGED STEEL

valves, fittings and flanges by Vogt

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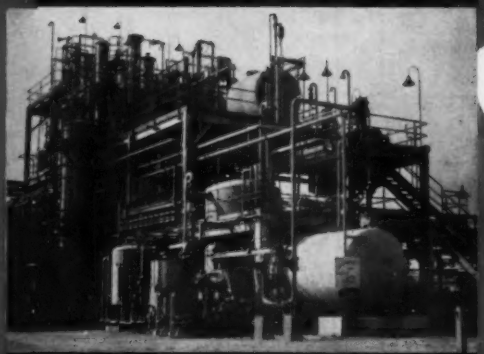

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POWER PLANTS

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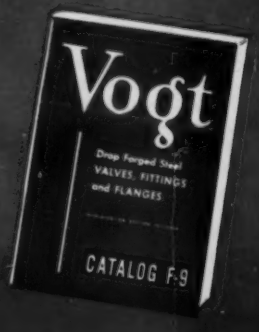
There are good reasons behind the trust which America's key industries have placed in Vogt valves, fittings, and flanges for half a century. They know that *drop forged materials* are uniform in structure, fine grained, and free from porosity. They know, too, and appreciate the meticulous care given these products through every stage of forging and machining in Vogt's modern shops, and about the many rigid tests and inspections. And that is why these products enjoy such an impressive record of performance in withstanding the shocks and stresses imposed by high or low pressures and temperatures and in resistance to erosive and corrosive conditions.

Service is another important factor in this confidence because Vogt maintains the world's largest and most complete stock of drop forged steel valves, fittings, and flanges always ready for immediate shipment.

Write for Catalog F-9. Consult its 400 pages for the complete Vogt line of drop forged steel valves, fittings, and flanges for oil, steam, water, air, gas, and refrigeration services.

Address Dept. 24A-FPLE



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Why a Steam Trap Has to Handle "Air"

Low temperatures and corrosion of equipment are often evidence of inadequate trap air venting capacity

Air, with its load of oxygen and carbon dioxide, has an unwholesome habit of interfering with the efficiency of steam heated units. If steam were always free of these undesirable companions, things would be a lot simpler for men-who-operate-plants. Because it isn't, three unhappy situations frequently occur:

1. ***Operating temperatures are subnormal.*** This is a two-part problem. First, an air-steam mixture has a lower temperature than pure steam at the same pressure—see Table A. Secondly, air can "plate out" on heat transfer surfaces as shown in Figure 1. Under some conditions, such an air film will knock down heat transfer efficiency by as much as 50%.

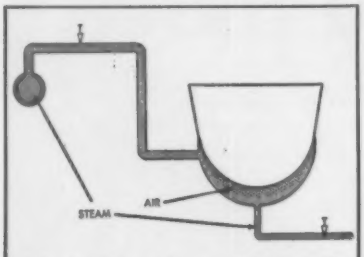


Fig. 1. *How air can "plate out" on heat transfer surfaces. This "insulation" drastically reduces heat transfer efficiency. Armstrong trap operation creates turbulence in the equipment that prevents this.*

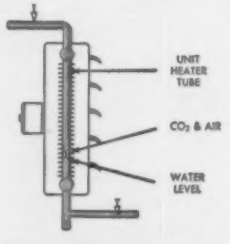


Fig. 2. *Corrosion occurs when units are not kept continuously free of both condensate and air. Armstrong traps discharge both,* at steam temperature, *as fast as they accumulate.*

2. ***Corrosion rears its ugly head.*** Oxygen and carbon dioxide are real trouble-makers. CO_2 gas goes into solution in condensate, forms carbonic acid and chews away at vulnerable metal sections. O_2 aggravates the situation. See Figure 2.

TABLE A—How air reduces steam temperature.

Gauge Pressure	Temp. of Steam with No Air Present	Temp. of Steam Mixed With Various Amounts of Air (% Air by Volume)	
		10%	30%
10.3	240.1	234.3	220.9
25.3	267.3	261.0	246.4
50.3	298.0	291.0	275.1
75.3	320.3	312.9	295.9
100.3	338.1	330.3	312.4

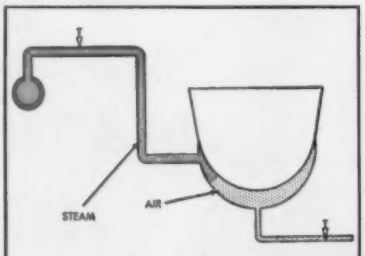


Fig. 3. *When steam is turned on, it takes a trap with extra air venting capacity to provide fast heat-up.*

3. ***Heat-up is slow as a snail.*** Air has a picnic in units that are shut off periodically. Figure 3 pictures the problem. Lines and equipment literally fill up with air. When the steam is turned on it can get in only as fast as the air gets out.

Enter Steam Traps

Curing these steam system ailments involves an operation sometimes called a "trap transplant." It consists of removing traps that don't get the air out and replacing them with traps that do.

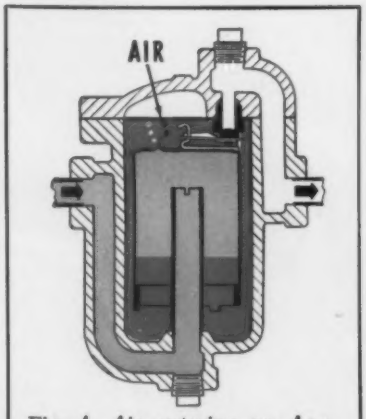
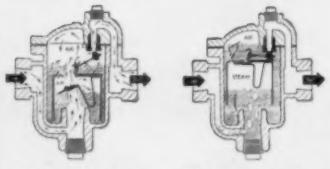


Fig. 4. *Air entering an Armstrong trap passes through the bucket vent and accumulates in the top of trap. When trap opens, air is discharged along with condensate.*

Figure 4 shows how an Armstrong inverted bucket trap continuously vents air. What the picture doesn't show is a built-in plus-value of this trap's design. An Armstrong trap opens suddenly, creating a momentary pressure drop and turbulence in the unit being drained. This breaks up air films and "pumps" air down to the trap so it can be vented.

The vents in standard Armstrong trap buckets will pass all the air normally encountered. In special cases, such as paper machine dryers, the vents are correctly sized larger at the factory to meet the requirement.



Thermostatic vent open. *Thermostatic vent closed.*

Fig. 5. *Open float with thermostatic vent for off-and-on units. When trap is cold, vent is open, permitting air to blow through when steam is turned on. When steam reaches trap, heat closes thermostatic vent. Then, regular bucket vent handles all air coming in with steam.*

Open Float with Thermostatic Vent

Super air-venting capacity is a must for fast heat-up of low pressure unit heaters, heating coils, steam headers and other units that are on-and-off. Figure 5 shows how the Armstrong open-float-with-thermostatic-vent trap takes care of this.

* * *

The 44-page Armstrong steam trap book covers other features of the Armstrong trap as well as its excellent air handling characteristics. This catalog also discusses trap selection, installation and maintenance. Your local Armstrong Representative or Distributor will be glad to give you a copy. Call him, or write Armstrong Machine Works, 9123 Maple Street, Three Rivers, Michigan.

ARMSTRONG STEAM TRAPS

For more facts circle 566 on Reply Card

What's Just Ahead in This Issue?

SAVED: 10,000,000 gallons of water per month—that's $36,000 a year that Convair, San Diego, has saved from going down the drain. A combination of common sense, leg work and good plant engineering has accomplished what any plant can achieve. Of course, not all plants can save that much money but it is a pretty safe bet they can all save as great a percentage of their total use. Look at—and read—the next three pages and see if we aren't right.

IF COATED abrasive belts in your plant are wearing out too soon, or if they are showing signs of uneven wear, then the article on page 138 will be of help to you. It points out that proper maintenance of such machine parts as contact wheels, bearings, spindles, etc., will improve belt efficiency. A chart is included which lists possible trouble spots, how they are caused and what you can do to correct them.

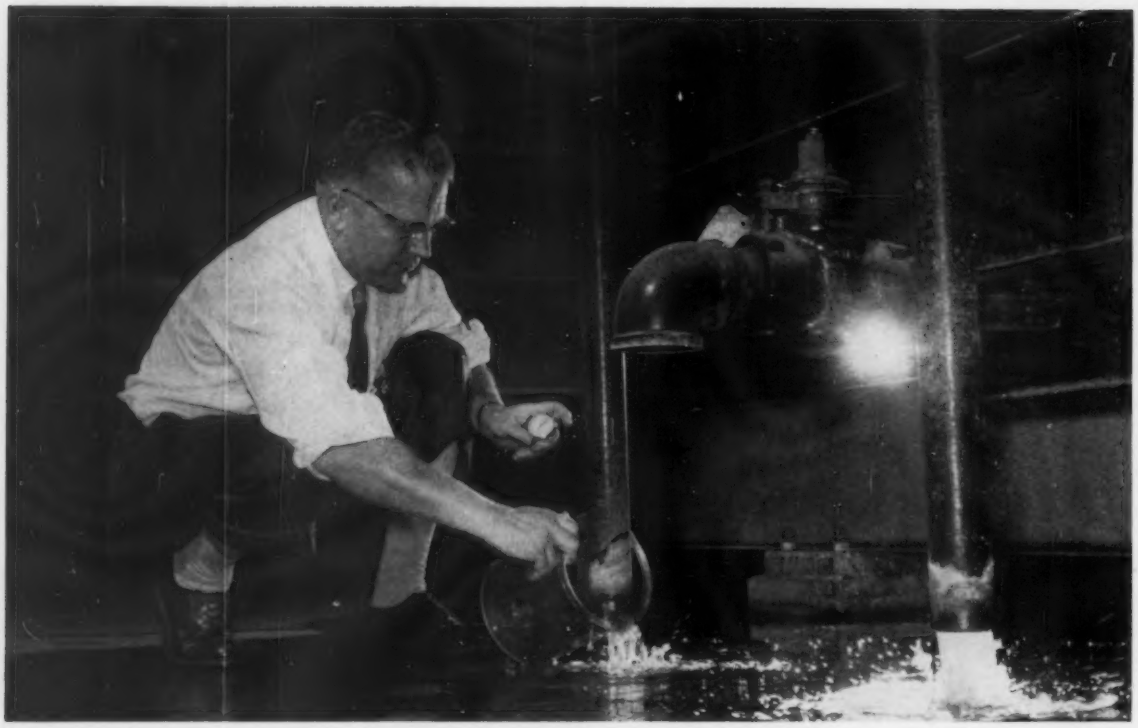
DARKNESS is no problem to the infrared camera; it does not require illumination of the subject by natural or artificial light to produce a picture. This photographic equipment reacts to heat radiation and can record hot spots that are not visibly detectable. For information on the principles of operation and some possible applications of the thermal camera, refer to page 105.

IS YOUR own plant engineering department organized along completely workable, and realistic, lines? Do you hold the proper place in top management circles? Douglas Aircraft's plant engineering department works because the organizational set-up is workable. For one of the most detailed descriptions of a plant engineering group, read the article starting on page 128. It may help you.

IS YOUR plant's power system properly grounded? If not, you may be asking for trouble. What would you do if a lot of your motors failed in a two-hour period? They could, you know. The article, beginning on page 122, discusses the pros and cons of grounded and ungrounded systems, and describes various methods of grounding practices.

OPEN TYPE electric motors have a habit of accumulating plant dust which has to be removed by periodical cleaning. A positive approach to the problem would be to keep the dirt away in the first place, through filtration. In one plant, the plant engineer and his men came up with shop-built units for cleaning motor cooling air. For details see page 112.

WANT A system for measuring the efficiency of your maintenance department? Why not take a look at what The Martin Company of Baltimore, Md., is doing. By working out the number of hours each job should take, the "effectiveness percentage" of completed jobs can be calculated. Put on a cumulative basis, the method has proved a worthwhile incentive to maintenance workers and has lowered maintenance costs. For the inside story, start reading on page 107.



Stop watch in hand, maintenance man checks to see how long it takes to fill a gallon measure or, how many gallons are going down the drain. Water being drained here is from a deoxidizing rinse tank. Method was quick and didn't call for cutting into pipe. By means similar to this plant engineering predicted annual savings of 120 million gallons

How To Save Water—Convair's Program

DOES IT PAY to save water? "Yes," say Convair (San Diego) plant engineers—and prove it with one of industry's most enlightened conservation programs. By sleuthing leaks to their sources, by monitoring every water-use process and by engineering maximum reuse, Convair is currrently saving 10,000,000 gallons a month, or more than $3200. And this, within 150 days after inaugurating its cut-consumption program.

Predicted annual savings: some 120 million gallons, at least $36,000.

Behind so significant a savings stands Convair's thesis: wasted water is wasted dollars . . . a truism applicable to plants everywhere, even where water's plentiful.

Convair's "Don't Waste Water" program, launched in April, 1957, began with a stern reappraisal based on water-use curves. During 1955, the plant's use-curve varied from a monthly low of about 28.5 million gallons to a high of 49 million. In 1956, water consumption—and also production was sharply up. The monthly high was some 56 million gallons. By 1957, traditionally low-consumption January saw gallonage top 42 million —14 million above the same month in 1955.

"Water," decided maintenance men, "is costing us too much money."

To prove the point, maintenance put a dollar value on water waste. From meter-bill calculations, Convair figured that it paid 18-cents for every 100 cu ft of water (1 cu ft = 7.5 gal). Additionally, sewer taxes amounted to 5 cents per 100 cu ft for a total cost—and loss—of 23 cents. Thus, loss of but 1 gpm during a two-shift day added up to 1,080 gal daily—to more than 336,000 gallons a year. Convair's dollar loss on so modest a waste: $104.

Plant engineering drew up a water cost analysis shown in Table I.

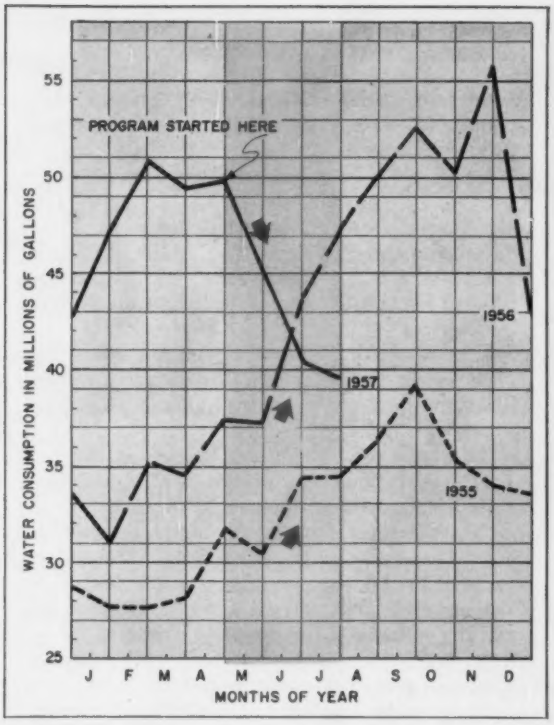
Chart in hand, Convair went sleuthing. Plant engineers traced to its use-source every gallon of water.

"That," explains mechanical engineer Eric Winchester, "was the first step . . . to find out where we were using water, exactly how much, and how we might reduce the gallonage."

Maintenance men metered every process. They did it simply by loosening a coupling or diverting a drain into a gallon container. Then, stop-watch in hand, they clocked how many seconds it took to fill the measure.

Example: On the drain of a warm rinse tank, they ran three counts, each time clocking the filling. On the first clocking, it took 19.5 seconds to fill the measure; on the second, 19.4 seconds. The third clocked-in at 19.5 seconds. Sum of the three (58.4 seconds) divided into 180 seconds, put water use at 3.07 gpm.

Similar tests were run on every Convair process, on



This chart shows how water consumption curve was reversed at period when consumption had, in other years, started its climb. Estimated savings in first year: 120 million gallons

Convair found that, even at top use, only 60 per cent of ports in wash fountains were being used. So, they plugged up 40 per cent. Saved: 700 gallons daily per wash fountain

Cuts Water Bills $36,000 Yearly

every faucet and lavatory. Result: a detailed water-use chart. The chart detailed each production process, pinpointed its location, indicated measured water consumption in gallons per minute (and steam use, if any), showed the routing ("discharge to floor drain") and recommended how consumption could be reduced, reused or otherwise minimized.

The compilation was completed in April, 1957, when total plant water consumption stood at 49.5 million gallons. By July, less than three months later, and though the conservation program had only just begun, Convair's maintenace staff had cut consumption by 10,000,000 gallons a month. Actually, the reduction was far greater. For, although July consumption was down to 39.5 million gallons, July usage — had it followed the expected and established curves—should have stood at 56 million gallons.

But maintenance wasn't simply talking gallons. It was talking dollars—the $3200 saved during July alone. All this anticipated a sizable annual reduction in water costs—which may, even in the program's first year, run above $36,000. Moreover, so astounding a savings came thru relatively simple and inexpensive conservation techniques:

Table I. This is how water use builds up even from seemingly insignificant losses for short periods such as lunch hour

	Total gallons consumed during periods listed below at rate of 1 gallon per minute				
Type of Service	Per Hour	Per Day	Per Month	Per Year	Wasted Cost Per Year
One Shift Day	60	540	14,000	168,000	$ 52.00
Two Shift Day	60	1,080	28,000	336,000	104.00
Continuous	60	1,440	43,800	525,000	161.00
Off Shift Time	60	360	15,120	181,000	55.00
Lunch Hour	30	60	1,560	19,000	6.00

Where They Saved the Money

1. 500,000 gallons a month—some $160.00—by reusing cooling water from a hydro press, rerouting it for use as rinse water in two other process units. Previously, the hydro press' coolant had been drained to the sewer.

2. 700 gallons a day per wash fountain simply by plugging 40 per cent of the ports in the plant's some 110 wash fountains (this 40 per cent was wasted anyway because no more than six men could use the circular washer at one time, although water gushed from all ports.)

3. 12,000 gallons a day—about $35 monthly—by replacing lever-handle flush valves on urinals with push-type valves, reducing per flush flow from three

Water, formerly lost, is used here in heat quench for cold rolled steel. Workman watches as water enters the tank

pints to but one pint. Valve replacement also saved $6291 a year in maintenance (because Convair figured it had to replace 140 of the lever-handle units yearly, while push-button valves require but little maintenance).

4. 2000 gallons a day by routing water, during daily firetank test runs, back into supply tanks (rather than to the sewer). Savings per year: about $380.

A maintenance summary reviews the savings:

"The discharge from the cooling system of the hydropress . . . was traced . . . and found to discharge into the rain conductor at column B-22.

"The line is 1½ in. pipe size, and it was discharging at an estimated rate of 20 gpm. This represents an annual waste of 6,750,000 gal at a cost of $2,080.00.

"The anodic rinse tank requires a flow rate just about equal to this waste flow rate. Further, the floor of the Dispatch Oven (heat treat quick quench) displaces approximately 1100 gal of water for each heat.

"The salt bath rinse tank and the anodic rinse tank are about 250 ft apart. There is, however, an abandoned 2 in steam line that parallels column row B. Approximately 100 ft of new pipe will be required to connect into and out of this steam line so that this fresh waste water can be substituted for fresh water at the anodic rinse tank. Cost should be less than $250.

"Note that this installation would be temporary until installation of equipment recommended in Bulletin 2. However, immediate savings of over 500,000 gal per month can be effected."

Here's an Example

OFTEN, MAINTENANCE engineers both conserved water and at the same time, improved processes.

How? Well, let's look at Plant Engineering's report (by W. H. Odle, Plant Engineer—Design) on one specific application.

Recommended Odle: "The following is an example of water savings that can be accomplished by use of automatic temperature control valves.

"The Rockford Planer at column AB-4 has an automatic temperature control valve to regulate the flow of water through the oil cooler. Water use is 1.4 gpm.

"The adjacent Rockford Planer at column A-B, 2-3, is identical except that water flow is not regulated. Water use is 6.5 gpm.

"Uncontrolled flow is 4½ times as much as controlled flow for the same duty. The difference between the two is straight waste at the rate of 1,713,600 gal a year. Cost of installing a temperature control valve to eliminate this waste will be less than $175. Annual savings (in water) amounts to $530."

Or, consider another engineered water saver, as recommended by Convair maintenance.

Said the report: "A survey was made of water used in four rinse tanks in the spotweld area in building No. 1. A metered check revealed a 24 hr usage of 3,255 gal. Restrictors were placed in the water lines and another metered check was made which revealed usage of 2,230 (over the same period), a savings of 1,025 gal daily for each of the four tanks. Net savings amount to 1,045,000 gal per year, or a yearly savings of $326.71."

Convair discovered that relatively simple engineering yielded big water savings—and at the same time, often slashed future maintenance costs. Example: its replacement of piston-type valves (on urinals) with less expensive, pushbutton valves.

"Maintenance," says the report, "adopted type A (push-button) valves instead of type B (oscillating handle). Type A cost only $7.80 per valve and flushed 1 pint of water. Type B cost $21.60 each and flushed a minimum of 3 pints with constant readjustment.

"Based on a daily use factor of two flushes per day per man or 48,000 flushes, the water saving would be 12,000 gal per day, or approximately 3,000,000 gal per year. Cost of water saved: $972.00.

"Chief repair item on the type B valves are pistons and operating handles. Approximately 140 handles are used per year. Cost of repairs are $910 per year.

"After all valves have been replaced the annual savings will be $972 water and $240 labor, or a total of $1212 per year." End

Gas-Generated Infrared Heat

Saves 55 Per Cent on High Bay Heating Costs

ANNUAL FUEL SAVINGS estimated at 55 per cent have been achieved in a New Jersey foundry where gas infrared heaters were installed instead of conventional units. Average monthly operating cost with infrared is estimated at $17.38 per 1000 sq ft, at AllCast Non-Ferrous Metals Co., Newark.

AllCast had to heat a foundry building measuring 40 ft by 60 ft and 35 ft high, plus an adjacent building used for grinding and finishing operations.

Because warm air from the unit heaters would ordinarily be wasted by its rising to the high monitor-top roof, gas infrared generators were installed in both areas. They warm workmen and the floor surface rather than the air in the building.

To heat the 2400-sq ft foundry area, 24 Perfection Schwank "rayheads" were assembled into six infrared generators. These were hung on 20-ft centers, 10 ft from side walls and 20 ft above the floor. Two additional generators were hung in the grinding and finishing room.

Installation cost amounted to $125.00 per generator and total installation cost was about the same as for conventional gas heating.

The six generators in the foundry are controlled by one thermostat, and the two generators in the grinding room by another. Each generator was fitted with an individual snap switch to cut it out if only partial heating is desired. See Fig. 2.

The real savings in the infrared system lay in operating economy. Cost estimates of infrared and conventional gas heating on this job show the comparisons in Table I.

The new infrared generators are products of Perfection Industries, division of Hupp Corp. By using the structure that supports combustion as the infrared emitter, the unit bypasses one stage in previous processes of gas infrared generation; no metal strips or louvers are needed. Higher operating temperatures are therefore feasible, and as a result, a maximum proportion of the gas Btu input is converted into usable infrared radiation. **End**

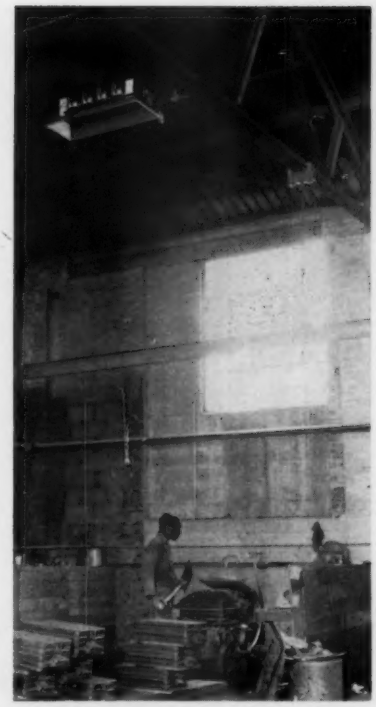


Fig. 1. Suspended unit at work station

Fig. 2. Thermostat, switches control heat

Table I. Cost comparison between vented gas unit heaters and gas-radiant units

Heat required	Vented gas unit heaters (850,000 Btu per hr)	Infrared Heaters (384,000 Btu per hr)
Use factor	2.32	2.32
Gas consumption	1,972,000 cu ft per yr	890,000 cu ft per yr
Rate	$0.75 per 1000 cu ft	$0.75 per 1000 cu ft
Fuel cost	$1479.00 per yr	$667.50 per yr.

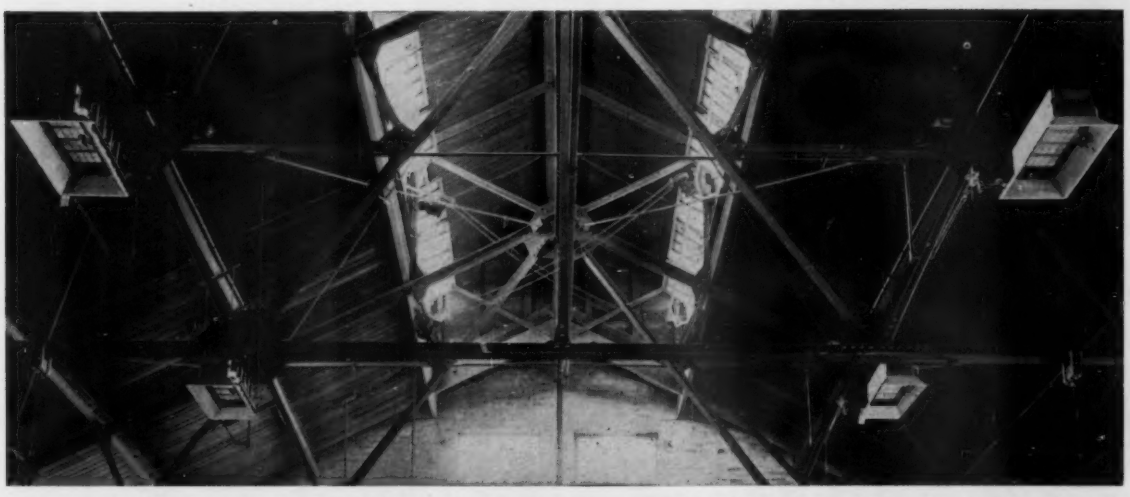


Fig. 3. Four of the six gas-fired infrared units, suspended above foundry areas. Each unit comprises four radiant "rayheads"

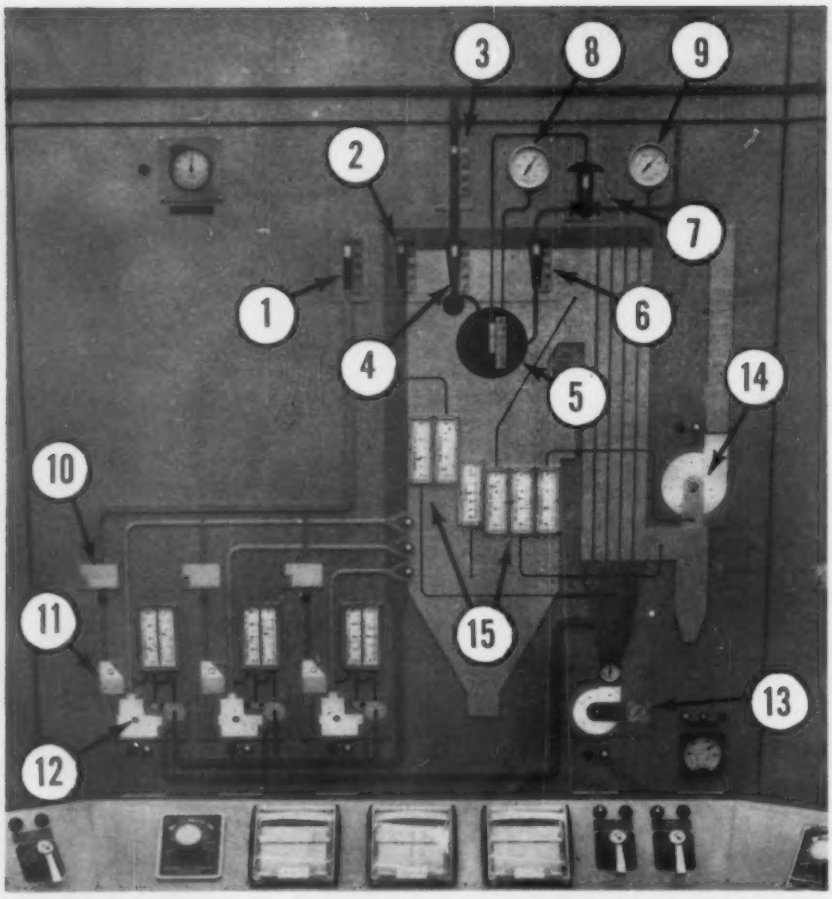


Fig. 1. Panel element designations are as follows: 1. Coal flow indicator, 2. Air flow indicator, 3. Steam temperature indicator, 4. Steam flow indicator, 5. Water level indicator, 6. Feedwater flow indicator, 7. Flow regulator, 8. Steam pressure gage, 9. Feedwater pressure gage, 10. Coal scale, 11. Coal feeder, 12. Pulv., 13. F.D. fan, 14. I.D. fan, 15. Draft gages

"Live" Boiler Diagrams

Corn Products Puts Symbols to Work in Control Room

CONTROL OF steam generation gets a special touch at the plant of the Corn Products Refining Company in Argo, Illinois. An installation of graphic panels, unusual for an industrial steam plant, gives the operator a quick picture of events in and around the boilers which, incidentally, have a 100 per cent feedwater make-up.

Panels are located, along with control consoles, in an enclosed area adjoining the boiler room. Liberal use of glass panels helps working conditions in that it eliminates the "closed-in" feeling. However, it is not necessary for the operators to observe equipment operation through the glass. The view is

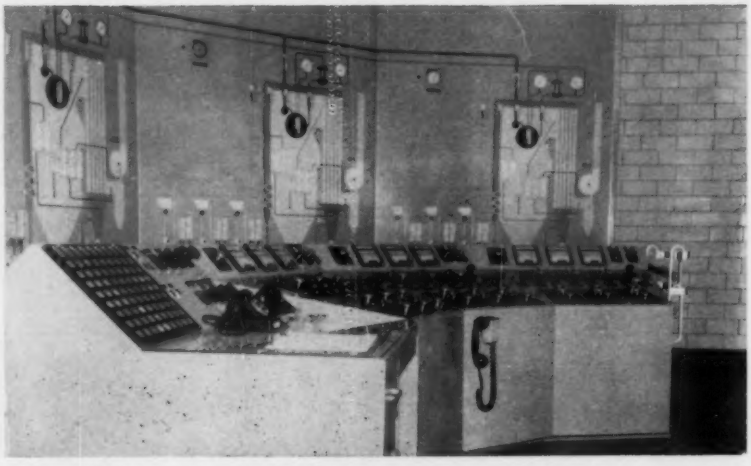


Fig. 2. Graphic panels teamed up with the control consoles make a nice setup

rather limited anyway inasmuch as the control room lies at the back of the units. The graphic panel more than makes up for that by doing the "seeing" for the operator.

Two of the present three panels have been in use since 1950 and the last one was added about 4 yrs later.

Various system lines and equipment symbols on the panels are color coded for easier identification. For example, blue is used to depict air handling equipment and passages; green takes care of feedwater lines; red is associated with steam. Pulverizer symbols are light yellow and a buff color has been assigned to coal feeders.

Three of the symbols on each of the panels monitor the operation of the coal scales serving one of the 250,000 lb per hr units. When coal is being dumped from the overhead bunker into a scale its respective symbol becomes illuminated. With the completion of the weighing operation the light goes out.

The coal travels from each scale to its respective feeder. Its movement through the coal feeder is picked up by a two-part symbol on the panel, each section having a separate color shade. If the coal is moving through the feeder at a low rate, the light portion of the symbol becomes illuminated. If the rate of feed is high, both the light and dark areas are lighted.

Each steam generating unit is equipped with three coal pulverizers, and their symbols on the panel are illuminated as long as the boiler is in operation. Draft gage connecting lines are shown graphically on each panel and run from the panel instruments to the places corresponding to the actual location of pressure pickup in the boiler and at the pulverizers.

Ahead of the symbol depicting a feedwater control valve there is a feedwater pressure gage. The pressure transmission line leads, of course, from the valve to the drum shown schematically as a black circle within which lies a feedwater level gage. Between the feedwater valve and the drum, a feedwater flow rate indicator has been included. Between the steam main on the panel and the drum there is a steam temperature indicator and steam flow gage.

Fig. 3. Operators observe annunciator board besides graphic panel indications

On the right side of the boiler cross section, the upper fan symbol pertains to the induced draft fan which draws flue gas through the air preheater. The lower symbol represents the forced draft fan which supplies air to the pulverizers.

It may be well to point out that the three pulverized coal burners of each boiler are ignited with oil. The three lights in the lower left section of the graphic boiler section are illuminated whenever there is a flow of oil to the burners for the purpose of ignition. See Fig. 1.

The graphic panels in front of the control consoles give the operator a greater degree of assurance in his adjustments of controls to meet changing conditions. They help increase his confidence because he can readily see what is taking place graphically in various sections of the boiler that are affected by his manipulations. He also can better coordinate the performance of all three units to suit load variations. In addition, the panels tend to reduce the pressure of operator responsibility and as a result they are helpful in the reduction of labor turnover. **End**

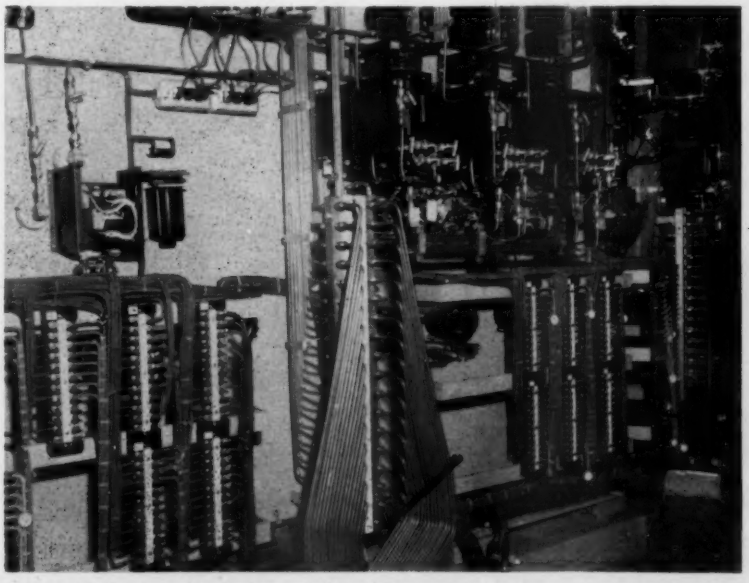


Fig. 4. This view shows some of the wiring and tubing runs behind the panels

Here, Everything's up in the Air!

Rapids-Standard's Planned Program of Technics, Designed To Increase Floor Space and Productive Capacity, Resulted in Utilization of Air Rights With These Benefits . . .

"Air and Equipment Are Cheaper Than Buildings"

THINGS HAVE HAPPENED in The Rapids-Standard plant in Grand Rapids, Mich., during the past ten years. In common with many medium-sized companies they found themselves in the interminable squeeze between higher material and labor costs and ever-increasing competitive pressure. Something had to give. They decided that the "something" would be outmoded plant layout, production controls and production methods. In this article we are going to confine the report to the plant layout and physical facilities although, in reality, they are inextricably bound together.

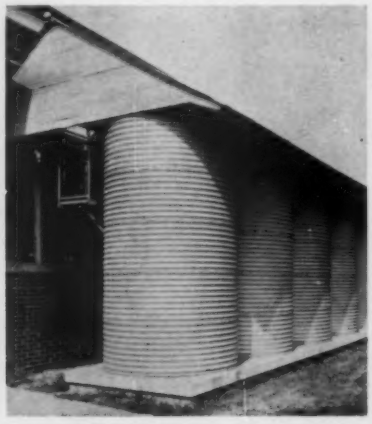
Good materials handling equipment and good materials handling they had; this is, perhaps, to be expected in a plant devoted to the manufacture of materials handling equipment. They did find, nevertheless, that they needed better *methods* of handling. Furthermore, they needed to solve machine loading problems, find more floor space, alleviate a shortage of storage facilities on the production line and a shortage of adequate aisles for fork truck traffic. To make things even worse they lacked proper storage and placement of material at the point of use.

In the words of Charles Filking, Chief Production Engineer, "If anyone had told us we were wasting an acre of space in our plant we would have been highly indignant. But when we were faced with the alternative of building on (at a highly conservative estimate of $300,000), or finding space within the plant, we found the acre."

They started shuffling departments around on their layout boards and the building seemed to get smaller as demands for space got larger and larger.

When they decided to reduce the problem to its simplest elements they were off-and-running. First job was to catalog all the parts used

Incoming conveyor wheels are dumped into the hopper of belt conveyor and are elevated to a series of conveyors which soon deliver them to the silos . . .



Stocks of conveyor wheels are stored in these outside steel silos until they are needed in the wheel conveyor assembly operation. They get here like this . . .

Horizontal belt conveyor running along the top of the outdoor storage silos dumps wheels into the empty silos by means of diverters on the conveyor . . .

In a Nutshell:

1. **Gained an acre of floor space in a plant with only 120,000 sq ft total area**
2. **Postponed plant addition that would have meant a $300,000 capital outlay**
3. **$100,000 more, formerly tied up in inventory, was released for working capital**
4. **Returned production workers to production, released them from materials handling chores**
5. **Increased productive capacity by 50 per cent**

in making the products—both purchased parts and those made in the plant. Surprisingly, they found almost six thousand different parts in many assorted sizes.

Next, they determined in what areas of the plant each part was used and they also tried to calculate how many of each part would be needed in each department, looking ahead five years in estimating this to provide adequate storage capacity for expected increased production.

An important target was the stocking of materials inventory at the point of use. Also, it was desirable to have each department surrounded by aisles as nearly as possible. This meant leaving wide aisles in which lift trucks could maneuver. And the plant was already so crowded there was no room for aisles.

Another prime objective was the provision of more storage capacity for finished products for shipment on short notice out of stock.

First things came first. Receiving and central stores were moved into the plant on the checkerboard of plant layout planning. Conveyor wheels were one of the space-takers —and thousands of them are used in Rapids-Standard products. The solution to their storage and use was found as shown in the series of photos on these two pages—into semi-automatic silos they went.

Now they had a little room in which to work. So, they followed the principles they knew applied to the problem: the use of the cube space in the plant, the claiming of air rights.

Positioned inventory at point of use was another principle which must be followed. And, they used materials handling equipment for storage to a greater extent than had ever been tried before in a "job" shop.

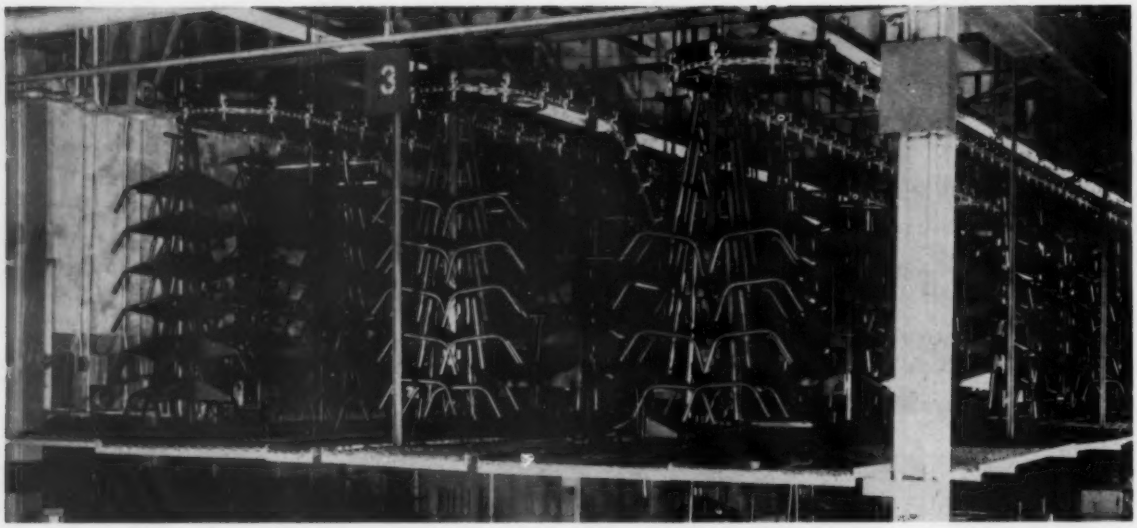
To increase the storage capacity of a given area of floor they used the principle that guided the skyscraper builders—air is cheaper than land. They decked some things up in live storage, in their own product —the Flow Rack storage conveyor. They were learning to "wear their own shoes."

Some things presented particular problems in storing them in the flow racks. For example, dies— and

As wheels are needed in assembly areas they are released from the bottom of storage silos by means of controlled chutes. From here they pass to . . .

An overhead conveyor on a cleated belt conveyor. From here they move to the various assembly areas where they can be distributed to assembly stations . . .

Workers at the gravity conveyor assembly stations can replenish their supply of wheels—steel or aluminum—by using the control switch located on bench



Efficient use of overhead space is obtained by conveyor in Q-stand inventory that stores odd-shapes in small space

the heavy steel shapes that come off The Rapids-Standard roll mill line. It's one thing to handle a tote pan with 50 lb of spacers in it; it's quite a different thing to handle an object that can weigh several hundred pounds. So, they had to develop powered lifts to get these objects into and out of racks. Here again, equipment cost less than additional floor space so it was a profitable investment.

Many things, they knew, could be suspended from the ceiling, and would actually make the work more efficient at the same time. Among the items falling in this category were welding jigs, assembled products such as curved sections of conveyors, stands, hinged sections. All of these were put on overhead trolley conveyor suspended from the ceiling.

The overhead trolley conveyor system was extended to reach more departments. This cut down a mountain of manual handling and saved miles of walking and truck transportation.

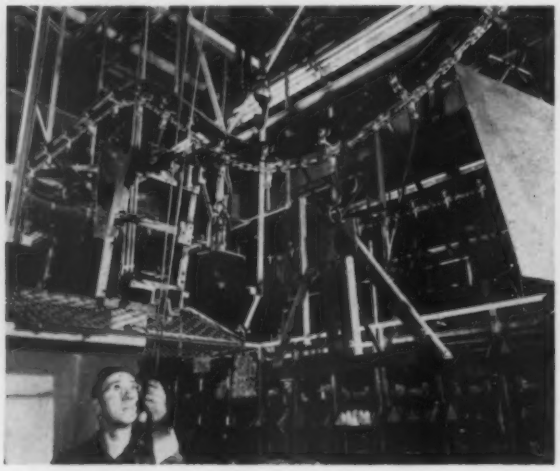
Truck handling techniques were improved. A Flow Rack was modified to leave space for the trucks under the rack; live storage was contained in the rack and dead storage was piled on top of the racks.

In order to provide additional storage space, an outside dock area was enclosed to give space for live "surge" storage for electric motors. As motors are received they are placed on thin metal pallets. A unique, multi-level, side-loading attachment allows the fork trucks to operate in an unusually narrow aisle. The truck moves to the Flow Rack opening and pallets are moved on or off as required.

Another feature that deserves expanded mention is the conveyorized live storage of welding jigs. An unusual use of the Company's trolley conveyor solved a tough problem for production workers. Locating, and putting to work the right welding fixture was a real problem when these jigs and fixtures are scattered.

In this new set-up, all jigs are hung from the trolley conveyor in predetermined positions and are indexed. When a particular welding

This is the indexed conveyor system that stores weldments until operator pushes button and weldment is delivered



After weldor completes a unit he places it on this belt conveyor that takes it to chipping and inspection department

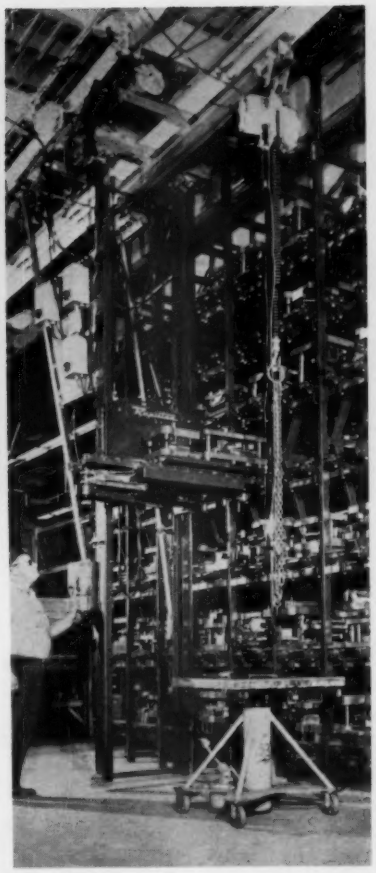
Two dies are shown here moving out of the die storage unit on a thin steel pallet

fixture is needed the weldor pushes a control button and the desired fixture is delivered at the conveyor dip.

Removal of the welded product from the welding area also had presented problems both in floor space and housekeeping. Formerly all chipping and scale removal had been performed in the welding area. This created safety, storage and housekeeping problems. Now, after a welder completes a job, he places the product part on a belt conveyor next to his work station. This horizontal belt conveyor carries the units through a central chipping and inspection operation. This keeps all the mess in one easily cleaned location.

Following chipping and inspection, parts are transferred to overhead trolley conveyor, passed through washing or degreasing operations, to automatic application of paint, then to the bake oven which, incidentally has been located on the roof. Finished parts are delivered to the assembly area ready to become a part of the product.

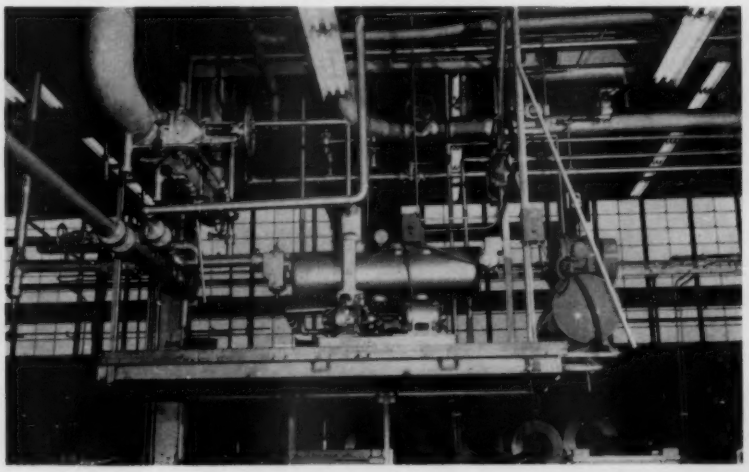
Air rights have been utilized for more than production equipment and materials. Outstanding examples of this are the shop offices that have been elevated with production operations going on beneath them. At another point in the plant the condensate return unit has been installed on a shelf-like arrangement suspended from above. End

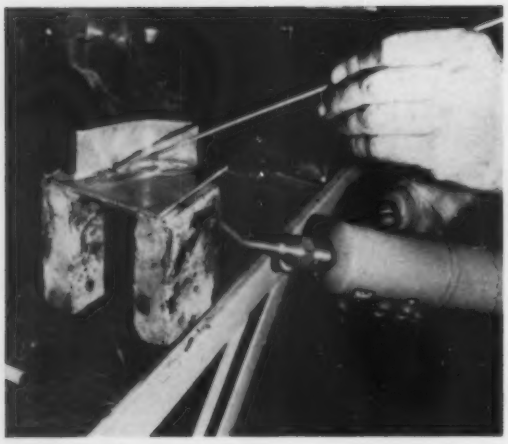


Overall view of die storage rack. It uses only 170 sq ft area compared to 375 sq ft formerly taken up by conventional type die storage tables. Its 91 hatch openings hold most of the large supply of dies used at Rapids-Standard. Besides saving space this new unit delivers dies to production as easily and safely as possible—no manual handling

Overhead offices also relieve congestion and each office frees 120 sq ft of floor

Just one more example of space saving is illustrated in this installation of condensate return pump and tank and auxiliary compressor on suspended platform





Above: InterAct wire is moved along the interface of the heated joint and the reaction begins. Upper right corner: Completed joint represents an actual chemical union between two pieces of aluminum. Right: Stress testing of the joint shows that it has greater strength than either piece of aluminum

Material Joins Similar, Dissimilar Metals

CHEMICAL JOINING of copper and aluminum and other metals is now commercially feasible because of a new joining material introduced to industry. The new material forms a permanent chemical bond through ion exchange between such materials as magnesium, titanium, brass, zinc, silver and gold.

According to the manufacturer, Intertectics, Inc., the resulting joint is usually stronger than either of the metals involved, is frequently greater in corrosion resistance, and has similar electrical, physical and chemical properties. On some types of joints, the manufacturer estimates that industry may save from 50 to 300 per cent of its present joining costs by using this material.

Chemically the material, known as InterAct, is a reaction eutectic, that is, a material which under the influence of heat eliminates the surface oxide layer and causes similar and dissimilar metals to flow together at temperatures lower than the melting point of either metal being used.

One of the chief features of the new material is that it lends itself to manual, assembly-line and automated techniques. There are three basic methods of use.

Manual operation involves the operator feeding the material into the joint, while the joint is heated with a torch. Once reaction has been reached, it takes approximately two seconds to complete the reaction. The joint is then fluxed with warm water to remove reaction by-products. Under such conditions, the operator must be masked, as the material is toxic to skin and lungs.

In an assembly operation, the materials to be joined are moved on a conveyor through an induction furnace or gas oven, heated to a temperature of approximately 810 F. The joining material is fed through a mechanized gun to the joint. Reaction is instantaneous. A water spray is then used to clean the joint. A hooded exhaust system vents fumes to the outside.

A third industrial method is similar to the second, except that through electric strip heaters, only areas to be joined are heated. **End**

Additional Information

If you would like more information about this joining material, write the Editor, Plant Engineering, 308 East James Street, Barrington, Illinois, or indicate "InterAct" on the post card in this issue.

Can You Use Heat Pictures?

Infrared Camera Can Pick Up Equipment Hot Spots

LIGHT, X-RAYS, RADIO, radar, atomic radiation and infrared—all are examples of what is called electromagnetic radiation. These are forms of energy obeying the same physical laws and displaying many common physical traits.

Waves are of different length: the shortest are x-rays and gamma rays, only millionths of an inch long, but vibrating very rapidly (i.e., having high frequencies). The longest electro-magnetic radiations are radio broadcast waves. These can be up to 300 meters long, but have a low frequency.

Infrared falls about midway between the very long and very short waves. Infrared radiation merges into visible light on the one side and short radar waves on the other. All objects normally emit infrared radiation.

As an object becomes more and more heated and the wave-lengths become shorter, the emitted radiation becomes visible—the object is now "red hot." This takes place in the neighborhood of 1000 F, with wavelengths about 4 microns long (a micron is 1/10,000th of a centimeter). The total radiation emitted by any object depends mainly on two factors: its temperature and its emissivity. Of course, area of radiation is also a factor.

The infrared radiation or heat given off by every object can be used to produce heat pictures. See Fig. 1. The Barnes Engineering Co. of Stamford, Conn. has developed a camera that detects infrared radiation and converts it into black and white photographs. See Fig. 3. Various areas of the heat image can be converted into temperature readings.

In operation, the camera is sighted on the object to be photographed. See Fig. 4. Although, apparently

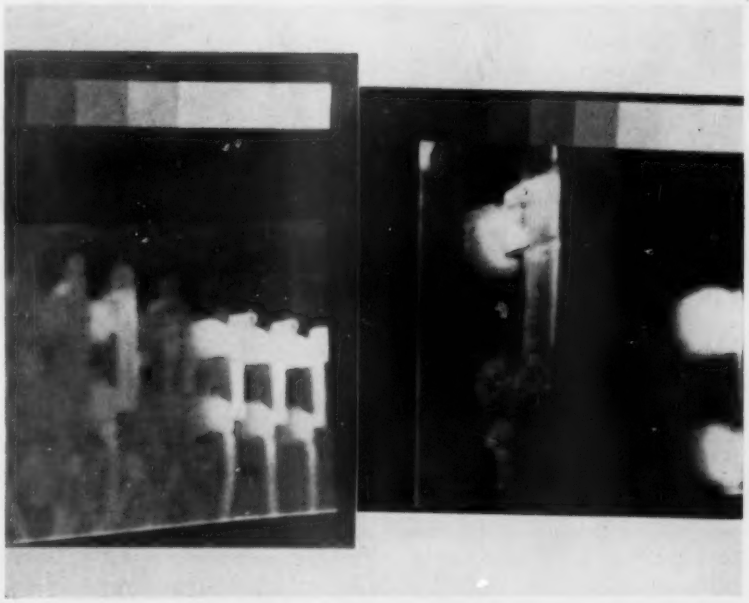


Fig. 1. Left infrared photo spots three hot switches; right, a poor contact

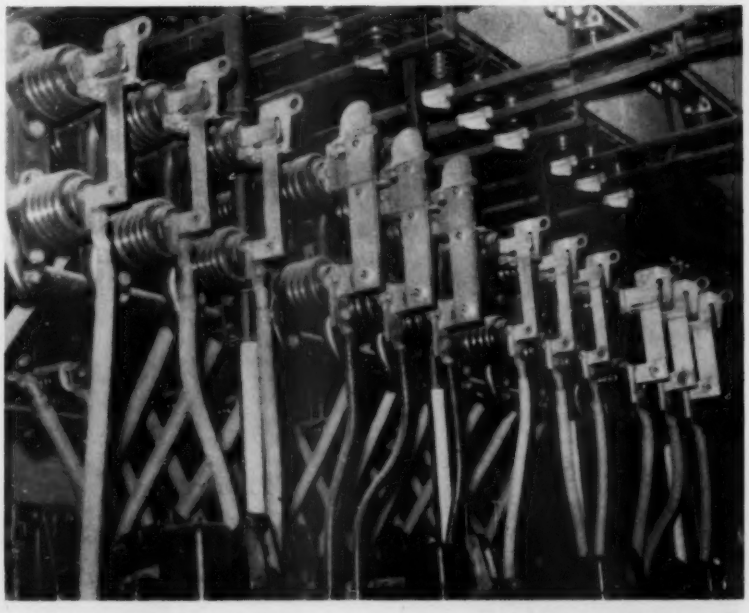


Fig. 2. For comparison here is a copy of a visual photograph of disconnects

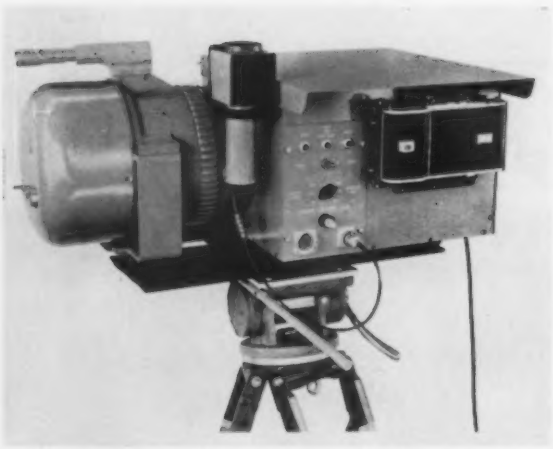


Fig. 3. The infrared camera assembly weight is about 100 lb

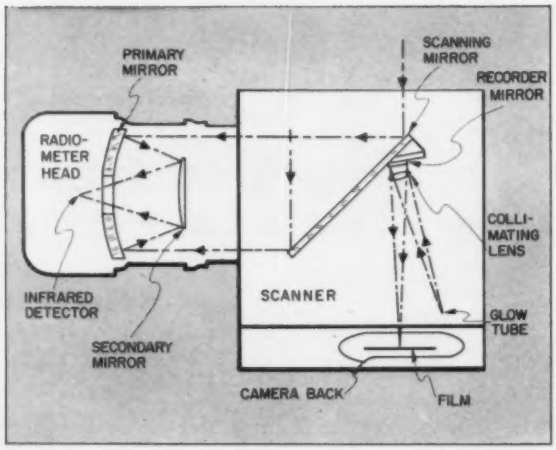


Fig. 4. Recorder mirror follows movement of scanning mirror

it is motionless during an exposure, an internal mirror scans back and forth across the field of view for several minutes.

An ultra-sensitive, fast heat detector in the radiometer picks up the radiation emitted by the object. This modulates a light beam. The more intense the radiation detected, the brighter the beam. The object or scene being photographed is scanned from top to bottom and side to side just as the image on a television screen. The modulated light beam is simultaneously scanned over the film in the corresponding pattern.

The final black-and-white picture is made up of a series of closely spaced lines. The light areas on the picture correspond to areas in the object emitting the most heat; dark areas mean less heat. Scanning time for a picture depends on the sensitivity and detail required; it may be as brief as two minutes or as long as fifteen. Sensitivity of the camera is very high. It can detect temperature differences as small as 0.02 C.

Possible Applications

Perhaps the widest application of thermal photography falls within the field of scanning industrial equipment and processes. A heat picture of refinery equipment, for example, can show where hot spots, may be developing.

Similarly, a picture of a bank of electric switches can reveal overheating of elements in the switches that might be due to overloading or poor switch contacts, Fig. 1.

It is important to realize that the great utility of thermal photography and infrared detection in general lies in its ability to detect and measure relatively low temperatures. There are many ways of detecting and measuring objects at high temperatures, once they have reached red heat. It is with objects below 1000 F, those that give no visual manifestation of heat, that thermal photography, and infrared radiation measurement is most useful.

Because thermal photography and infrared radiometry do not depend on visible light and do not require physical contact with the object, they can be used widely in industrial quality control. For example, a normal heat distribution pattern can be established for electronic equipment. After final assembly, the camera can scan each chassis and sound a warning or otherwise indicate if the heat pattern of the chassis does not conform to normal. See Fig. 5.

Heat patterns can detect faulty welds, overheating of machine parts, defects in metal castings and built-up sections. **End**

Fig. 5. Brightness can be compared to temperature scale

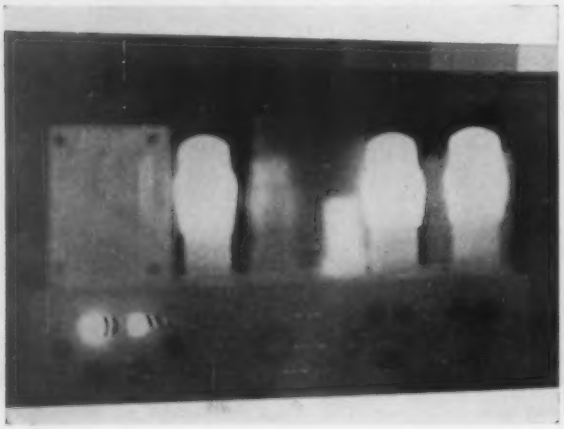


Fig. 6. Pole transformer images caused by infrared radiation

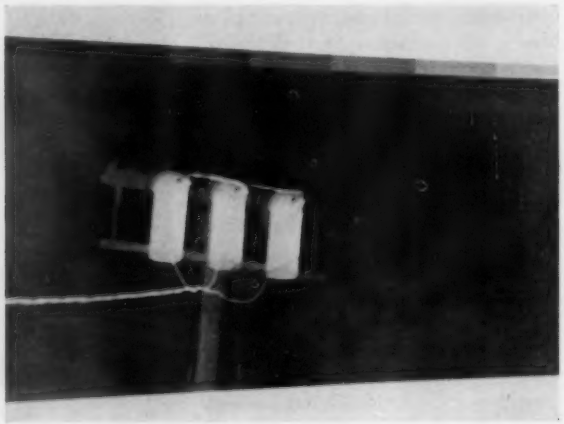


Fig. 1. Maintenance in high places is faster, more efficient with lift tower than with old method using scaffolding (right)

Measuring Stick for Maintenance

"Effectiveness" Percentage Shows Accomplishment

By GEORGE T. NEMPHOS, Supervisor, Maintenance Planning and Scheduling, The Martin Co.

IN A COMPANY BUDGET, one of the largest overhead items is maintenance. It is an ever-present cost, yet it is a vitally important operation if a manufacturer is to continue to put out a quality product with the greatest efficiency. A new concept of measuring the weekly accomplishments of the Maintenance department is now in practice at Martin. The measuring stick being used to determine high and low maintenance output is termed "effectiveness."

No one likes to work in the dark. Everyone wants to know how he is progressing. The employee who knows that his superiors are interested in what he is doing and how well he is doing it, will work more efficiently once he sees a definite goal clearly outlined before him. If he has no defined goal, it is likely he will lack any incentive drive and his work will become slipshod and automatic, completely void of any imagination or desire to improve.

One way to furnish the employee with the information that will supply the goal towards which he can

Fig. 2. Plastic blocks (arrows) supersede painted aisle lines, mean less upkeep

strive is to compute the amount of time it takes to do a given job against the amount of time allotted for that job. By dividing the actual time into the allotted time, the percentage of effectiveness can be determined.

For example, if a group is given 222 hours to do a job and it actually takes 238 hours to complete it, the group effectiveness is 93 per cent, which is excellent.

Naturally, some jobs can be done under the allotted time, others will take longer. But the time saved on a job that takes less than the allotted time can be applied to the longer jobs and there is a leveling-off effect in the effectivity percentage. Thus the feeling that last week's percentage cannot be bettered is eliminated.

The Standards and Methods department compiles the figures by which the weekly effectiveness of each group can be studied. Each week a report is issued, presenting not only this information but also the departmental effectiveness as a whole. In addition, each report gives an accumulative figure, from the first of the year, giving the current effectiveness for the department. The current week's percentage and the previous week's percentage are compared so that each group will know whether or not it has bettered its performance.

Considerable competition has been engendered between the groups within the department because of this recently adopted system. The competitive spirit that has developed is a healthy indication of the teamwork and efficiency of the department. The result of this friendly rivalry has necessarily been an increasing stream of suggestions for improved maintenance methods, as each group strives to raise its effectiveness percentage by reducing the manhours required for allotted jobs.

A case in point is the newly-acquired hydraulically-operated Strato-Tower. Previous to its acquisition, a hand-operated scaffold was used to maintain various facilities throughout the plant. See Fig. 1. As can be readily imagined, the handling of the wooden scaffold was almost a job in itself. It took four men to move the scaffolding into position to work on the hangar doors. Added to that was the outmoded use of the hand-operated jack for raising the scaffold to the desired height.

Time Saving Tower

The lift tower, on the other hand, is completely mobile and hydraulically-operated from the working platform. Only two men are needed in this operation, one at the bottom to run the truck and the other on the working platform doing the job. Its greatest advantage is, of course, its mobility. With the tower mounted on a truck, there is easily a 50 per cent time saving in going from one job to another.

When maintenance work is being done on the hangar doors, for instance, the lift tower can be moved the entire length of the doors in a comparatively short time and with practically no effort at all. Such a saving in time results in a significant maintenance cost reduction.

Another use for the device is in connection with the outdoor floodlights. These lights, mounted on ordinary telephone poles, have six bulbs that must be changed periodically. Formerly, a man had to put on climbers and mount the pole carrying only two of the bulbs. To change the six bulbs, three trips up and down the pole were required and the whole job took four hours to complete. With the lift tower, one man can change all six bulbs in an hour.

The Maintenance department, incidentally, is now lending the lift tower to the Production Department for use in work on the Sea-Master tail assembly so that time will not have to be wasted in building up the usual construction scaffolding.

Through the efforts of the Building Group, the painting of plant aisle lines will soon become an obsolete operation at Martin. These lines will be replaced with a series of plastic white blocks embedded in the floor about three feet apart, Fig. 2. The blocks will automatically be cleaned as the power sweeper periodically sweeps the aisles so that painting will become unnecessary.

Red blocks will be used to mark areas in which smoking is prohibited, in places where electrical equipment abuts the aisle, or in other areas of potential danger. Yellow blocks are used as a precautionary measure to mark elevator entrances and doorways which open onto the aisle.

At the present time, forty hours a week are spent in painting aisle lines. When the new method is generally adopted, not only this time but the cost of the paint and the maintenance of the line-painting machine will be saved.

In conjunction with this program, lines in the parking lots are being replaced by steel markers, seen in Fig. 3, which perform the same service and require a minimum of maintenance.

Many maintenance manhours were saved when the post-type parking barriers were removed. These metal posts were used to prevent cars from backing into the fencing surrounding the parking lots. However, they presented a continuous maintenance problem because cars backed in to them and bent them so

that they were perpetually having to be straightened or replaced.

A steel angle iron has now been set in the paving against which the automobile tires rest exactly as they do against a curbstone, and no damage can be done to them by bumpers or fenders. Not only does the angle iron do the same job better but it improves the appearance of the parking lot and eliminates maintenance costs.

Valve Change Cures Saw Ills

In another instance, Martin-designed honeycomb saws, during the developmental stages, were causing delays and production losses in the Manufacturing department. These slab saws, which are used to cut honeycomb panels to a desired thickness much as one would cut a slice off a loaf of bread, were causing material scrapping.

This damage resulted from the irregularity in the blade speed which, reduced by improperly operating motor governors, made the blade dig into the honeycomb and ruin the panel. To eliminate this condition, these air-operated, butterfly-type governors were removed and air flow regulator valves, which have no moving parts and so require no maintenance, were installed. The converted equipment is now trouble-free and no scrapped honeycomb has occurred since the time of the conversion.

During a routine maintenance inspection last year, it was discovered that one of the concrete ramps at the airport was settling and opening at the joints. This discovery posed the possibility that the ramp, which leads into the water, was being undermined by the tides and might wash out at any time.

After a survey by a diving company, the Plant Engineering department recommended that the concrete slabs be grouted. This process consists of filling the voids or washouts under the concrete slabs by pumping a thin mixture of sand and concrete through pre-drilled holes in the ramp surface.

When the Plant Maintenance Field department attempted to obtain a grouting pump, it was learned that to rent a pump or to have the work done by a contracting company would be too costly and take more time than was available.

Fig. 3. Steel angle iron replaces metal posts in parking lot. Result: less damage

Faced with this situation, Maintenance built a grouting pump. A design was quickly made and the materials gathered. The pressure cylinder was made from a piece of 12-in. high pressure steel pipe, 6 ft long. Steel plates were welded to the ends of the pipe, after which a 6-in. hole was cut in the side of the cylinder to accommodate a 4-in. stop valve through which the cylinder is loaded.

A loading hopper was made from sheet metal and welded to the top of the stop valve. A 1-in. airline was tapped into the one end of the cylinder and a 2½-in. airline was tapped out the other end to carry the grout. In the top of the cylinder, just above the outlet pipe, a manually operated relief valve was installed to relieve the pressure in case the outlet should become clogged. The machine was then mounted on wheels so that it could easily be moved where needed. Total fabricating time was sixty hours.

The entire machine was made from salvaged material except for the length of grouting hose that was purchased for about one-tenth the cost of a new one.

All these examples are practical illustrations of the cost-reducing, effectiveness concept as exercised at Martin. **End**

Fig. 4. Shop-built grouting pump cost one-tenth of new one, did job in 10 days

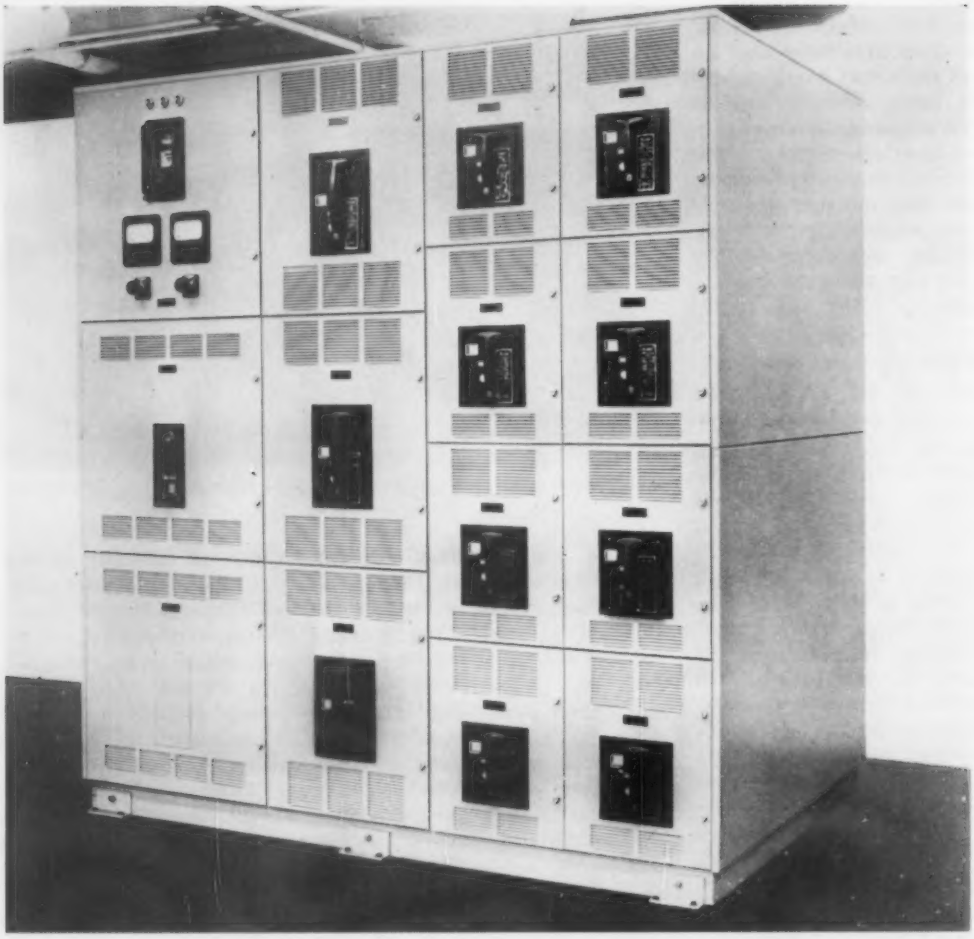


Fig. 1. Four-high stacking of 600 amp breakers saves cost of an additional section in this switchgear

New Look in 600-Volt Switchgear

Compact Circuit Breakers Feature Stored Energy Closing

QUICK-MAKE CLOSING, formerly available only on electrically-operated breakers, is now a standard feature of all manual breakers in the K-line announced by the I-T-E Circuit Breaker Company. A spring-action mechanism provides the quick-make action. It is powerful enough to close the contacts safely against a full short circuit.

The first 90 per cent of travel of the pull-down handle stores energy in the spring. In the last 10 per cent of travel, the stored energy is released to close the contacts. Because contacts can not be teased together slowly, breaker life is greatly extended even when closing against rated loads.

Electrically-operated models have an actuating motor in addition to the basic stored energy system. Only 10 amp is required to close this breaker compared to as much as 160 amps in previous designs. Energy for closing is pre-stored within two seconds. Closing time is five cycles.

Four-high stacking of 600-amp breakers has been made possible by a one-third reduction in height of the breaker. Compartment width is two inches less than previous designs.

Breaker weight also has been reduced to provide easier handling and permit the use of fewer personnel when replacements or changes

Additional Information

If you would like more information about this low voltage switchgear, just write to the Editor, Plant Engineering, 308 E. James St. Barrington, Illinois, or indicate "Compact Switchgear" on the post card in this issue.

are made in installations. Weight of the 600-amp breaker has been reduced 30 per cent. There is a 55 per cent reduction in the weight of the 1600-amp size and the 225-amp breaker weighs virtually the same as before.

The new breakers may be moved to test and disconnect positions without opening the compartment door. A lift-shutter, which allows insertion of the crank that moves the breaker in and out, can be padlocked in either the test or disconnect positions to guarantee complete safety. The shutter can not be lifted until the breaker is tripped. While the shutter is open, the breaker can not be closed.

The extendable escutcheon slides through the compartment door as the breaker is moved to test and disconnect positions, while a dust seal, surrounding the escutcheon, is held in place by the door.

Overcurrent trips are out in the open and easily adjusted and can be changed quickly. Where trips for individual phases were separately mounted on former breakers, trips for all three phases in the 225 and 600 amp breakers are combined on a single moulding. Each trip can be used over a wider range of continuous load conditions. Last minute changes in load capacity can be met, in many cases, with an existing breaker and trip as a result of this wider range of trip settings. **End**

Fig. 2. Movement of handle through first 9/10 of travel charges system, last 1/10 of travel releases the stored energy for quick-make operation. Trip button on front of panel opens breaker

Fig. 3. Breaker is moved to test position with crank inserted through lift shutter

Fig. 4. Trips, on manual and electrical types, provide new ease of adjustment

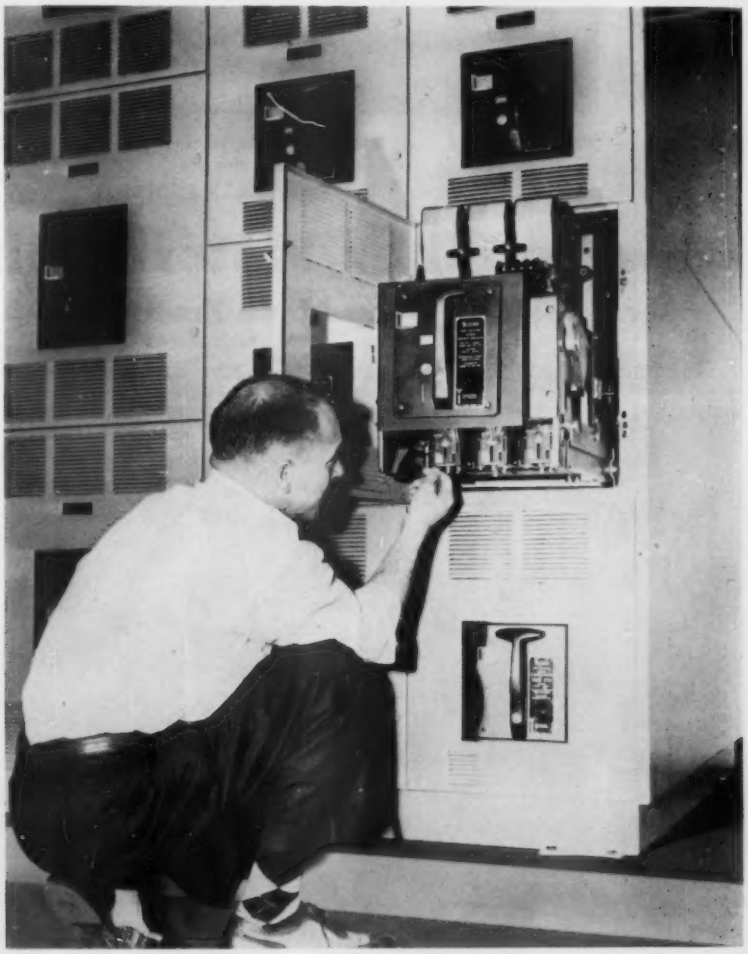


Fig. 1. Standard duct fittings are used for conveying filtered air for cooling this motor

How To Filter Motor-Cooling Air

Elements Held in Shop-Made Frames Trap Dust

By VICTOR C. COOKE, Plant Engineer, Lake Erie Engineering Corp., Kenmore, N. Y.

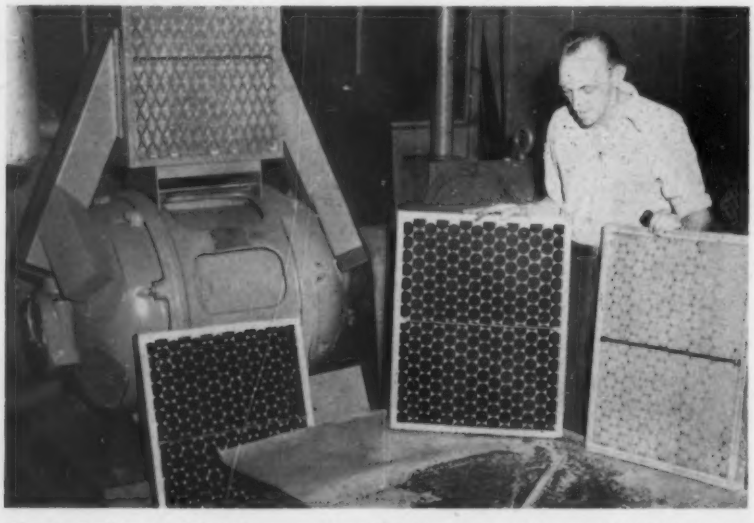


Fig. 2. Darkened elements were removed after two-month use. Note loose dirt

WAYS AND MEANS of removing dust from open-type electric motors have received considerable attention in the past. Such factors as proper air pressure for cleaning, solvent suitability and time scheduling for the job have been subjects of conversation. But what about keeping the motors clean in the first place?

In our case, we used the basic approach of filtering the motor supply air. Consequently, we found very little dirt in motors that were equipped with filters after they were cleaned. The units were in operation over a three-month period prior to the check.

In a typical filtering arrangement, two mineral wool filters are supported in a metal frame which is

Fig. 3. Channels guide movement of filters into frame

Fig. 4. The fan (arrow) moves air through motor passages

covered on three sides with sheet metal. See Fig. 3. Angle iron guides help the changing of filter elements and expanded metal is used to protect the exposed faces of the filters.

Work on the filter enclosures was done in the maintenance shop by plant mechanics. Size of the filter elements was standardized in order to avoid keeping too many sizes in stock; the size suits all of the larger motors in the plant.

It was found that most of the conventional motors had enough fan capacity built into them to draw a sufficient amount of air through the filters. A temperature check was made on the motor before and after the installation of filters.

On some of the older and slower motors it was found necessary to install a blower to force air through (see Fig. 4) particularly on motors connected to planner drives. Motors on the latter operate with reversed rotation over short periods of time. Typical air moving equipment consists of a fractional horsepower motor driving a squirrel cage blower with 500 cfm capacity. **End**

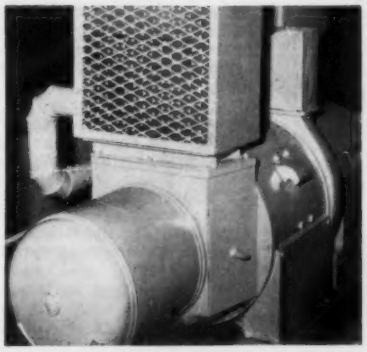


Fig. 5. Motor and generator share air

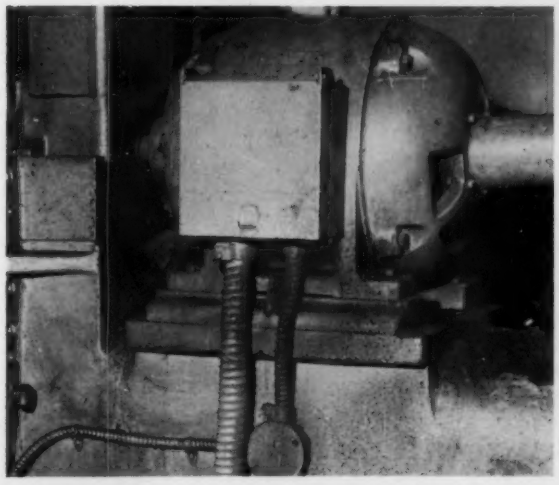


Fig. 6. Dust collection around a unit that used unfiltered air

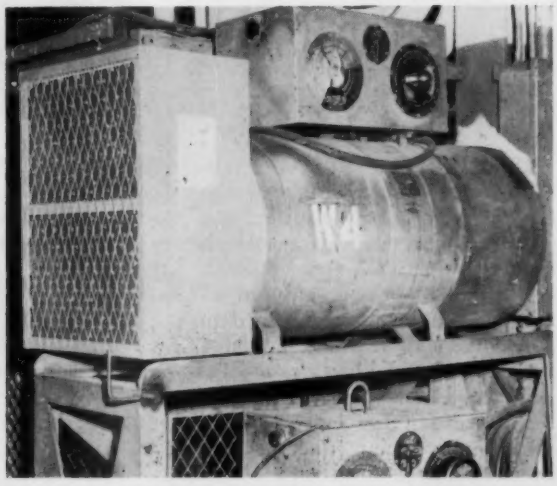


Fig. 7. Arc-welding machine equipped for air-filtering setup

Got Some Tough Lube Problems?

Maybe Moly Has the Right Answer for You

By **ALFRED SONNTAG**
President
Alpha Molykote Corp.
Camden, N. J.

This large drier is essentially a horizontal cylinder supported by trunnion rings at either end. These trunnions must support 2¼ tons of weight. Conventional E. P. greases did not have the film strength to support the load. Now with an application of lithium grease, (in the manner shown above) containing a high percentage of molybdenum disulfide, lubrication is confined to "touching up" the trunnion rings twice weekly. Maintenance men at Bakelite applied grease daily and even then there was excessive wear.

WITH THE STEADY advances in machine design over the past decade, the need has intensified for lubricants which perform effectively under difficult operating conditions. Modern industrial equipment has stepped up plant production speeds and made possible vastly improved end-products—but at the same time it has posed new problems in maintenance, particularly in regard to lubrication.

Where extreme conditions of pressure, motion and heat are prevalent, adequate and lasting lubrication becomes highly difficult. Conventional lubricants are often worked out or wiped away soon after they are applied, a situation leading to rapid wearing or failure of machine parts. For this reason, molybdenum disulfide (MoS_2), a lubricant additive with unusual protective properties under critical conditions, is more and more finding favor.

Molybdenum disulfide sustains lubrication thanks to its unique combination of physical properties: it films out on surfaces; it provides a strong, durable film; it maintains a low coefficient of friction; it remains thermally stable; and it resists chemical attack.

A blue-gray powder, molybdenum disulfide is an effective lubricant when merely rubbed or burnished on surfaces in its dry form. For the most part, however, it is used as an additive for oils and greases. Although this mate-

Several applications for molybdenum disulfide lubricants where conventional lubricants have not performed satisfactorily

Application	How MoS_2 Was Applied	Results
All sliding surfaces of machinery during initial assembly	Very light coating of lithium grease containing high percentage of medium fine molybdenum disulfide	Prevents galling and seizing of new parts during critical stages of initial run-in of machinery
Threaded connections and power screws at all temperatures—300 F. to 1600 F.	Very light coating of lithium grease containing high percentage of medium fine molybdenum disulfide	Nearly 100 per cent safety against galling and seizing is obtained even after years of exposure to high temperatures
Natural and synthetic rubber shaft seals of all types	Very light coating of silicone grease containing high percentage of medium fine molybdenum disulfide	Wherever metal slides against rubber, leather or packings even at high sliding speeds. This has proven most successful in jet engines and automobiles
Oven bearings and conveyor chains at elevated temperatures or when exposed to chemical attack	Synthetic oil containing Microsize molybdenum disulfide	The oil carries the molybdenum disulfide to the bearing surfaces. While the carrier evaporates through heat or is removed by chemical vapors, the MoS_2 remains to lubricate
Drawing wire of spring quality steel	3 per cent of pure molybdenum disulfide added to solid soap and stearate mixture	Smoother surface finish and longer die life. Increased drawing speed
Steam-jacketed plug valve to control flow of slurry from sulphur well	A synthetic lubricant containing molybdenum disulfide used as a plug lubricant	Lubricant not affected by sulphur or 325 F. temperature
Roll-neck bearings in rolling mills	A lithium grease containing a high concentration of molybdenum disulfide is used to pre-coat the journal and bearing for run in. For resupplying the MoS_2, 0.4 per cent fine-particle size molybdenum disulfide was added to the circulating oil	Resulted in superior finish of journal and bearing. Use of MoS_2 for breaking in roll-neck reduced galling
Calender with plain sleeve bearings	1 per cent fine-particle size MoS_2 added to oil of main calender bearing ring feed	Under loads of 75,000 lb bearing temperature dropped from 239 F. to 149 F.
Highly stressed journal bearings (babbitt) for high-power, high-velocity fan	Extreme pressure grease plus molybdenum disulfide	Reduced galling during break-in of the bearing

Bakelite now uses molybdenum disulfide on all gear fits operating at high temperatures such as on shafts of Banburys, rolls, and couplings—in short, any place where machinery must be taken apart. Here moly is being applied to the shaft of Banbury rotor to prevent "freezing" of parts, subsequent galling

rial was relatively unknown to lubricating engineers before 1948, its discovery dates back to the 18th century, or perhaps even earlier. Bartlett Mountain, located at Climax, Colorado, constitutes the bulk of the world's known supply today. Back in 1879 a prospector in search of gold and silver staked a claim on this vast deposit which at the time was considered of little value. Today ore from this mine is crushed, screened and then processed through a series of milling, classifying and flotation stages to produce molybdenum disulfide.

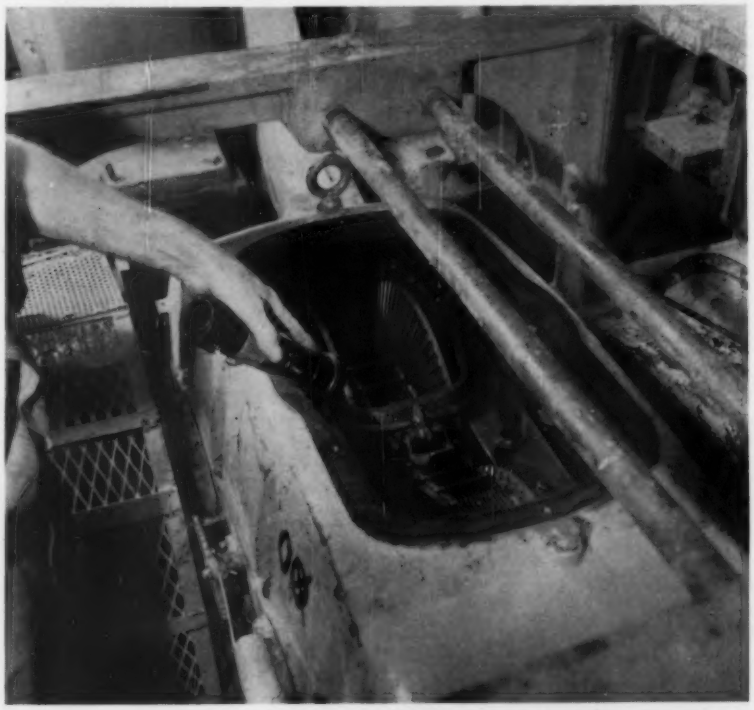
Chemical Properties: Molybdenum disulfide is a mineral having a molecular weight of 160.08, a melting point of above 2700 F, specific gravity of 4.8 to 5.0, and a hardness of 1 (Mohs Scale). It has a high affinity for metals. When dispersed in a suitable lubricant, it tends to bond to rubbing metal surfaces and form low-friction films.

After a lubricant containing MoS_2 has been in service a short time, particles of the additive begin to film out on the metal rubbing surfaces. If the carrying lubricant is squeezed out by pressure or wiped away during service, the film of MoS_2 provides extended lubrication. Its strength is adequate to prevent welding, galling, fretting and seizure of rubbing surfaces under extreme pressure. Its low shear strength keeps friction coefficients low—coefficients of friction actually decrease as pressures increase.

Once a film of molybdenum disulfide is established, it will provide effective lubricating action at temperatures between—300 F and +750 F in air. In a vacuum or inert atmosphere, it does not show any change in structure or composition, even after heating above 2000 F. A chemically stable compound, it is unaffected by water, oil, alkalies, and most acids (except strongly oxidizing acids such as aqua regia and hot concentrated sulfuric and nitric acids).

Unusual Laminar Structure: Basic to the lubricating properties of molybdenum disulfide is its laminar structure. In its crystals, a layer of molybdenum atoms is sandwiched between two layers of sulfur atoms. The sulfur atoms have a strong affinity for metals, causing MoS_2 particles to adhere tightly when in contact with metal surfaces.

The sulfur-to-metal attraction coupled with the sliding motion of moving metal parts orients the



Variable speed drives shown here operate at 50 deg above summer ambient temperatures of 120 F. Result: chain sprockets and chains were having a life of only months. Bakelite tried several different oils before going to one containing molybdenum disulfide. Since adding moly chains last several years

Putting connecting gear in place on shaft of Banbury at Bakelite. Shaft has been rubbed with moly to insure ease of assembly and subsequent disassembly. Formerly, the gears would freeze. And, this resulted in expensive maintenance

molecular layers parallel to the bearing surfaces. This mechanism takes particles of MoS_2 out of suspension in a lubricant and bonds them mechanically to metal surfaces. The sulfur atoms are held to each other by weak bonds, accounting for the low shear strength of this material.

Where MoS_2 Lubricants are Used: Molybdenum disulfide lubricants do not replace conventional oils and greases in applications where they have proved adequate. On both a weight and volume basis, MoS_2 lubricants are more expensive than conventional types, and thus they are uneconomical under ordinary conditions. But there are a great many applications where ordinary lubricants are inadequate—and it is here that MoS_2 comes into play.

Oils and greases containing this unique additive have proved effective under difficult operating conditions as: extreme bearing pressures; extreme temperatures; metal forming; corrosive environments; inaccessibility for relubrication; and reciprocating motion.

MoS_2 Solves Problems at Bakelite Plant: A great many maintenance problems—unresolved for years—have been overcome by the use of molybdenum disulfide-containing lubricants. A good case in point is Bakelite Company's Bound Brook, New Jersey, plant. One place where the lubrication problem was acute, about five years ago, was in the variable speed drives on one of its production units—and as a result, the company turned to molybdenum disulfide as a possible solution.

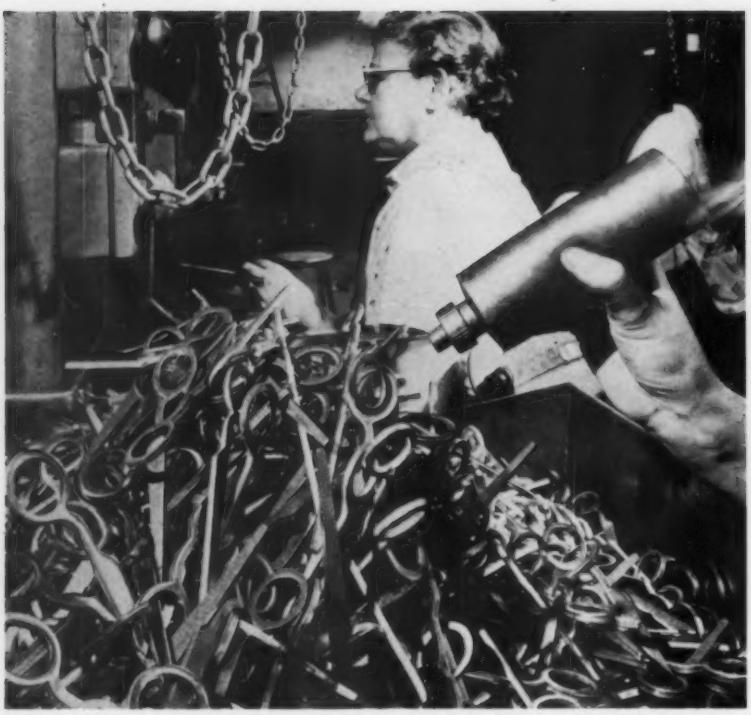
Difficulty on these drives was traced mainly to overload, with ambient temperatures rising as high as 120 F. In the operating area, there was excessive chain wear.

Chain sprockets and chains had a life of but a few months. After much searching for an answer, the lubrication foreman tried an oil with a molybdenum disulfide additive. It was soon found that the chain had prolonged life and that wear on the face of the sprocket was reduced. Thus, occurrence of breakdowns on these drives, which are continuously in operation, was reduced by some 75 per cent or more.

Bakelite soon discovered other critical conditions where MoS_2 provided the solution. For example, press-fitted gears operating at high temperatures on calendars, Banbury, rolls and mixers were difficult to remove without galling damage in the fits. In repair work, the bore of a gear and journal of a roll are now cleaned with kerosene and then a light coat of molybdenum disulfide powder is worked into the surfaces. Assembly and disassembly are now much easier and galling and seizing have practically been eliminated.

Another spot where MoS_2 lubricants have been found effective for Bakelite is on a Rotex sifter. This device, which slides on two pads, is situated in a dusty area, and prior to the adoption of MoS_2 required daily cleaning and lubrication. Today a lithium base grease containing MoS_2 is applied to the surface of the slides. This imparts a light film which adheres to the metal surfaces instead of being wiped off like the grease previously used. As a result, both load and dust adhesion are greatly reduced, and in turn there is less wear and less service required.

Still another instance where Bakelite reduced its maintenance problems with MoS_2 is in a giant drier, 20 ft long and 5½ ft in diameter. This device was a victim of extensive wear at the trunnions and rolls when ordinary grease was applied. A lithium grease containing molybdenum disulfide proved highly successful. Now lubrication of this equipment is confined merely to touching up trunnion rings twice a



Operator at Acme Shear Co. Bridgeport, Conn., sprays moly powder on scissors blanks prior to their cold forging on a 650-ton press. Advantages of lubricant are increased in die life, increased production and a better finish

week. This constitutes a vast gain over the former lubricant which required daily application (and even this was not frequent enough).

Soap Producer Finds MoS_2 a Boon: One of the nation's leading soap producers also has found molybdenum disulfide the answer to many of its maintenance troubles. MoS_2's ability to stand up under steam is one factor which led to its adoption at this plant. One of the lubricating difficulties of a soap plant stems from the fact that soap powder sticks tenaciously to production equipment. Thus, machinery must be steam cleaned each shift. Conventional oil is wiped off in this procedure, but MoS_2 remains there and sustains lubrication.

The plant's Process Division also found molybdenum disulfide effective for use on studs, particularly for steam and pumps and compressors on fatty acid splitting equipment. Here conditions range from 400 to 850 lb of pressure, and temperatures of 600 to 730 F. Conventional oils will coke under such conditions, but MoS_2 is not hurt by these temperatures.

One specific example of this advantage can be cited in the case of a particular nut which holds the piston rod on a steam compressor. This nut must be taken off regularly. When conventional oils were being used, this could not be done, and the pistons and rods had to be replaced. Today, the nut is lubricated with MoS_2 and it can be removed later without difficulty.

Until recently press-fitted cylinder sleeves also posed a lubrication problem at this soap plant. Oil and graphite were used on them, but without much success. A combination of molybdenum disulfide and oil was applied, making it possible to pull the sleeves into the rough casting with ease, and to remove them readily when necessary. Previously the sleeve had to be split to get it out. An MoS_2 lubricant also was found effective on the conveyors used to handle scrap soap.

Further applications of MoS_2 lubricants by this manufacturer include: stainless steel pipe fittings; threaded and expansion joints; valve seats in pump bodies; stainless steel nuts and bolts (to prevent galling and stripping).

Maintenance of Dies: Not only has molybdenum disulfide proved of value in overcoming numerous maintenance difficulties—it also has resulted in definite production benefits. The Acme Shear Company, Bridgeport, Connecticut, a manufacturer of scissors, sprays an MoS_2 powder on scissor blanks, prior to cold forming in a 650-ton press. Transferred to the die during forming, the lubricant extends die life substantially. But equally significant, it increases production and produces a vastly improved finish on final pieces.

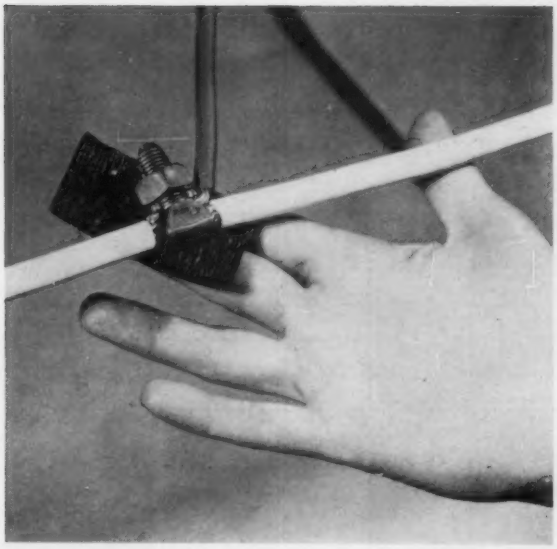
A number of manufacturers have reported success in the use of molybdenum disulfide in wire drawing operations. One company, drawing stainless steel, discovered that an MoS_2 lubricant eliminates scoring of the drawn material and reduces wear of dies. It also increases drawing speed considerably. Still another manufacturer, principally concerned with the drawing of copper alloy wires, found that a tablespoonful of a molybdenum disulfide grease increased production speed by some 800 ft per minute.

MoS_2 lubricants also have shown to advantage in such production operations as aluminum extrusion, drawing of stainless steel tubing, hobbing of cold heading dies, and punching steel parts.

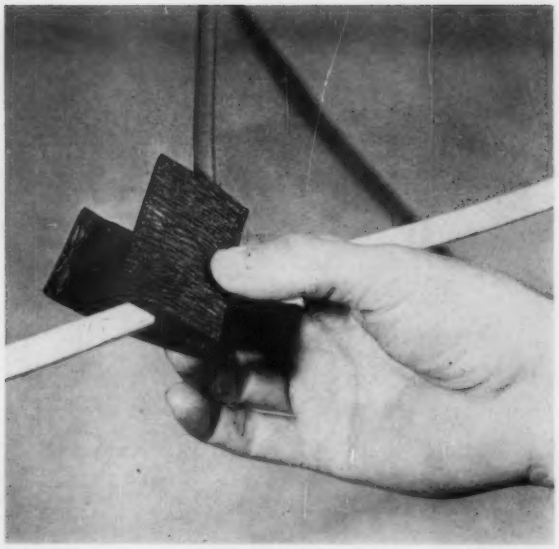
Almost daily, MoS_2 lubricants are being tried in new application where conventional lubricants are not performing successfully. The table on page 115 should serve to support and supplement the examples described in some detail in the preceding paragraphs. **End**

Want Tear Sheets?

If you would like tear sheets of any articles appearing in this issue, don't rip this magazine apart; others may want to read it. Just drop a line to The Editor, Plant Engineering, 308 East James St., Barrington, Ill. We'll be glad to send them just as long as the supply lasts.



STEP 1 A two-inch piece of the insulating putty, Scotchfil, is placed directly behind the one-inch electrical connector



STEP 2 A second two-inch piece of insulating putty is placed over the connector and at a right angle to the first piece

Insulating Putty Simplifies Splicing Job

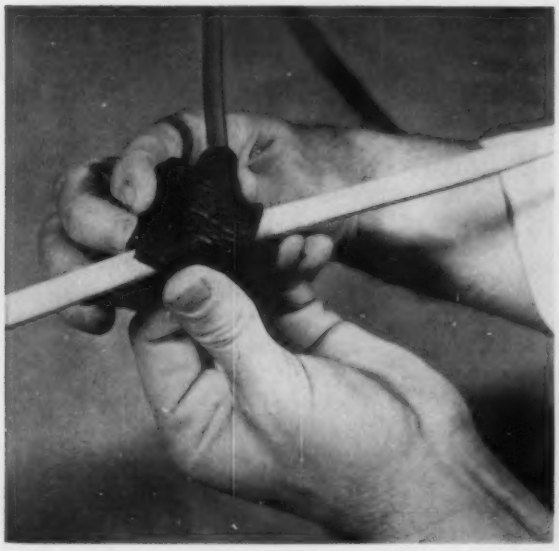
Saves Time, Tape and Provides Standard on Splicing

PADDING THE sharp corners on electrical connectors, corners of bus bars, or as a cable-splice build-up is a simple task now thanks to this insulating putty.

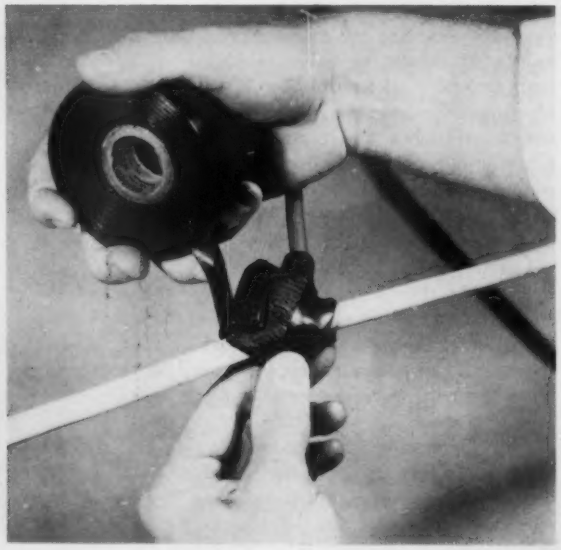
As indicated in the illustrations, first form a cross with two pieces of Scotchfil insulating putty. After the putty, made by the Minnesota Mining and Manufacturing Company, has been applied, it should be molded and compressed by a moderate finger pressure to eliminate voids and air pockets. In a short time, it will fuse into a homogenous mass. The splice is then wrapped with tape.

About 15 per cent of the average time required for insulating splices is saved, according to the manufacturer, along with about 50 per cent of the tape normally used. In addition, the method provides a standard which helps in eliminating variables in splice quality. **End**

STEP 3 The ends of the two pieces are squeezed together with moderate pressure so they overlap center of other piece



STEP 4 Then to complete the job, the padded splice, now fused into a homogenous mass, is wrapped with electrical tape



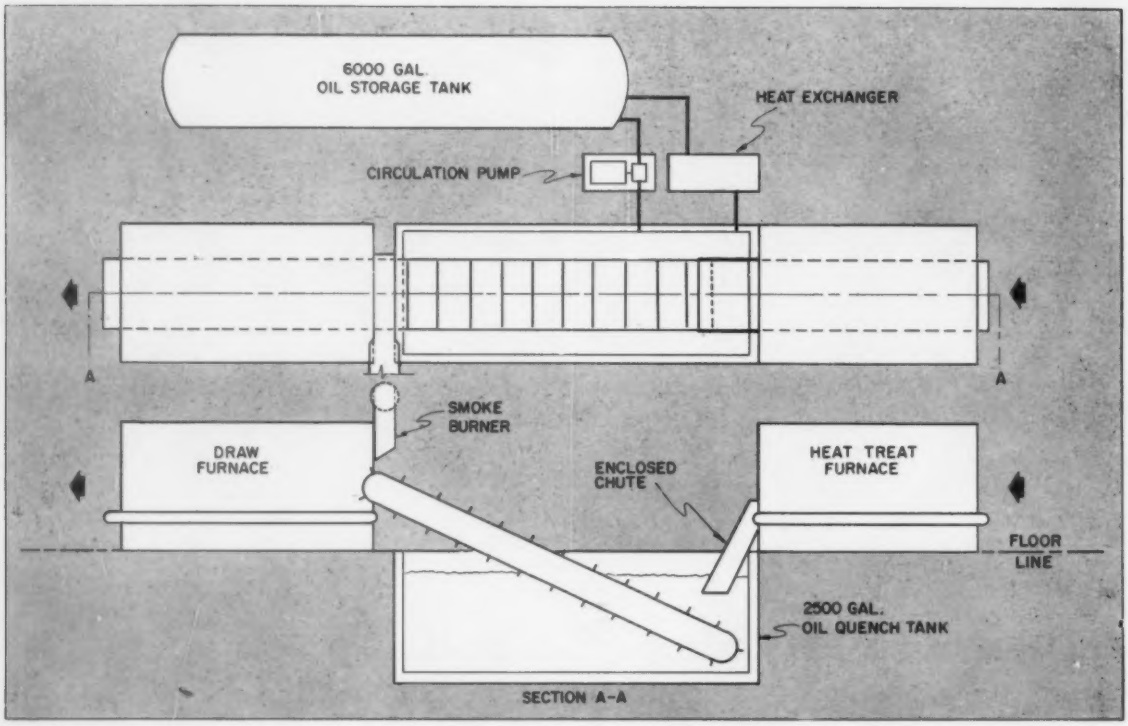


Fig. 1. Circulating system maintains oil temperature. Parts are automatically transferred from heat to quench to draw

Tempering Line for Tough Tools

Shop-Built System Reduces Rejects, Smoke and Fumes

By JIM WEEKS, Plant Engineer, Proto Tool Company, Los Angeles, California

FEW MANUFACTURED products are over-stressed more often during normal service life than conventional hand tools. Manufacturers of socket wrenches, pliers, torque wrenches and screwdrivers must employ every means at their command to secure consistent high strength and optimum metallurgical properties in each tool produced.

Given good raw material to begin with, the final quality and strength of a hand tool hinges largely on the efficiency of the final heat treatment and drawing processes to secure just the right degree of hardness and temper.

Fully aware of this fact, we decided to build our own final heat treatment and draw furnaces and tool them with automatic oil-quenching equipment that would obtain the desired consistent high quality results.

The furnaces are conventional gas-fired units equipped with complete instrument controls and conveyors. The heat treating furnace is designed to handle 1500 lb per hour with the conveyor designed for 30 lb sq ft loading. The draw furnace is designed to accept the discharge from the heat treating furnace.

To secure consistent quenching, the temperature of the quenching oil can be controlled at any desired point between 110 F and 150 F. This is well below the 340 F flashpoint. Another design objective is to minimize flashing and thus reduce smoke in keeping with regulations set up by the air pollution control district if Los Angles.

Quenching facilities consist of a sub-surface, 2500 gal, tank in line with the two furnaces. A 6000 gal underground storage tank, heat exchanger, circulating pumps, filters and screens are also part of the quench system.

When the material leaves the heat treating furnace conveyor, it is discharged into an inclined chute and falls into the quenching oil. The material settles down through the oil onto the immersed end of the conveyor that will carry it up and into the draw furnace. The transfer from furnace to furnace is entirely automatic.

The details of the installation were carefully engineered to secure de-

sired results. The inclined angle of the chute from the heat treating furnace to the quench tank was established to prevent the oil from splashing and contacting the hot conveyor in the heat treating furnace. This eliminates flashing and the creation of air-polluting smoke.

To further minimize flashing, recirculated and cooled oil directly from the heat exchanger is pumped into a jacket which surrounds the inclined chute. This jacket serves to make the chute a double-walled structure, with cooled oil filling the space between the inner and outer walls.

The temperature inside the chute is kept low enough to minimize flashing when the material contacts the quenching oil. The same pump that fills the chute, discharges oil through jets to create the turbulence necessary for good quenching.

Turbulence is also aided by a second pump which takes oil from the quench tank and forces it through a system of screens and filters, and then through jets back into the quench tank. Overflow oil from the quench tank, caused by oil pumped in from the heat exchanger, flows by gravity back into the 6000 gal underground storage tank.

Another detail that required careful engineering was the wicketed conveyor that transfers heat treated material from the quench tank to the draw furnace. At this point in production, the tools must be handled carefully to prevent gouging, scratching and other forms of surface injury.

Fig. 2. After heat treating, parts fall through chute, arrow, into oil quench tank

The company-designed conveyor is 30 in. wide with one inch by four inch wickets crossing between the two drive chains at two foot intervals. The conveyor trough is one half inch steel plate and is kept well lubricated by the quenching oil carried up on it. The drive chains and wickets are provided with ample slack so that if a tool happens to get trapped under a wicket, it slides upward easily along the sheet steel conveyor trough without scratching.

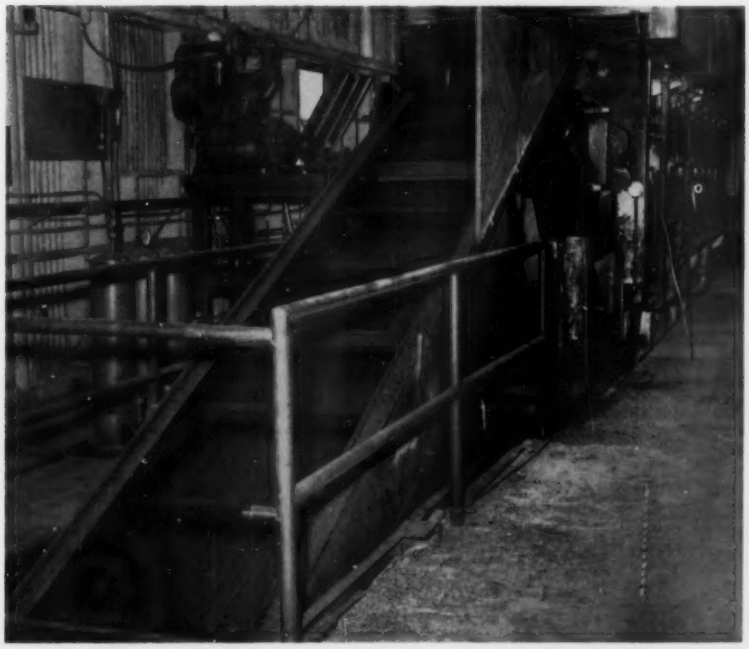
This may seem like a minor point but we could not find a commercially available quenching tank conveyor that would handle our particular work. Practically all quench tank conveyors are of the perforated bucket type.

We manufacture some 1600 items of various shapes and sizes. If the perforations in the buckets were large, some of our smaller items would fall through. If the perforations were small, they would be perfect "fouling places" for some of our pointed products such as center punches.

With a center punch fouled in a bucket perforation, something would have to give. Usually, this would break a piece out of the bucket, producing a large hole through which other work would fall and be lost.

The final touch, to secure the approval of the air pollution control district, was the installation of a small smoke burner. This eliminates the small amount of smoke created at the charge end of the draw furnace when the work falls onto the hot conveyor before it enters the furnace combustion chamber. **End**

Fig. 3. Parts are automatically transferred from oil quench bath to draw furnace



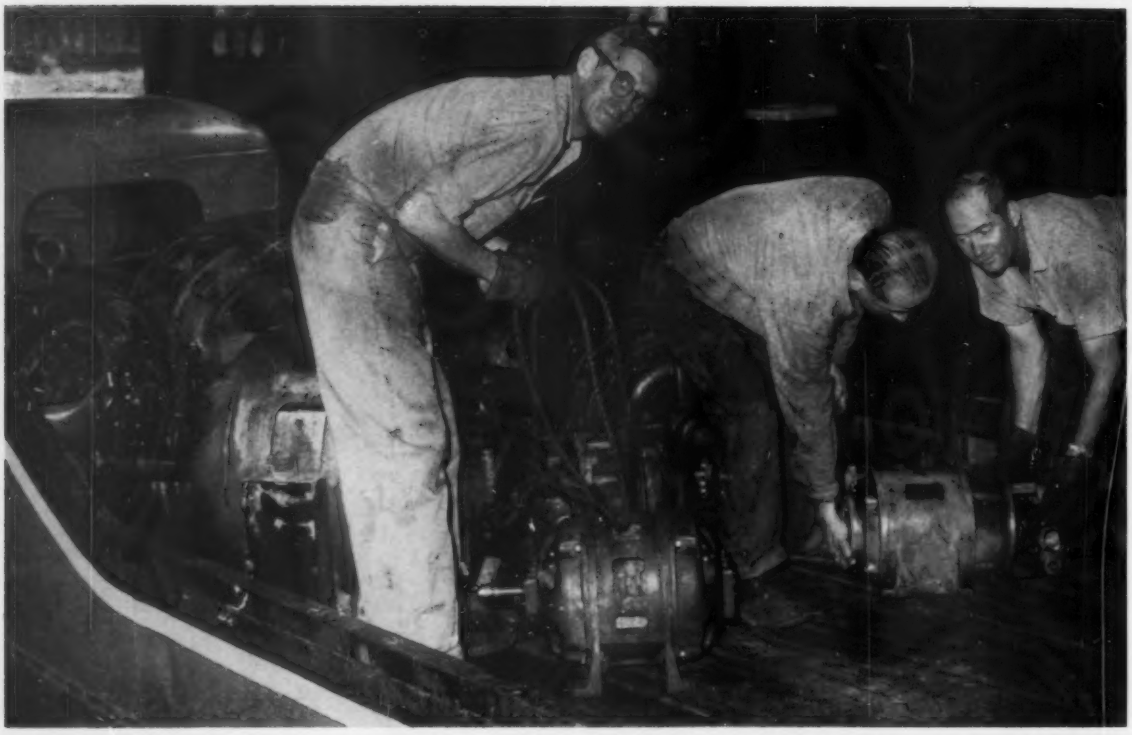


Fig. 1. Production motors on their way to repair shop. This could happen to you if you are operating an ungrounded system

Why You Should Ground Power Systems

Fault Location Simplified and Overvoltages Reduced

By W. C. HEINZ, Application Engineering, General Electric Company, Cleveland, Ohio

FORTY MOTOR FAILURES in a two-hour period! What would this do to your production schedule? Does it give you an uneasy feeling to realize that this might occur in your plant? This is not a mythical tale, since it actually was experienced by a West Coast manufacturing plant. Although such a large number of failures is unusual, it is not uncommon to find pairs of, or even several, motors failing simultaneously when operating on a so-called ungrounded power system.

One of the characteristics of such a power system is that it is subjected to relatively severe transient overvoltages; and these transient overvoltages were the cause of the motor failures mentioned in the example above. The overvoltages in this case resulted when the control circuit in one of the motor starters began arcing intermittently to the grounded enclosure. Had the system been grounded, the circuit would likely have been isolated when the first arc occurred and no motor failures would have been experienced.

The foregoing example indicates one method whereby excessive voltage-to-ground can occur in an ungrounded power system. There are other ways, such as accidental contact with a high voltage system, or resonance in a series circuit, and the end results could be as destructive. Obviously such overvoltages are instantaneously applied to all equipment connected to the system, thus accounting for multiple failures.

Thus far, it has been indicated that the detrimental overvoltages are transient in nature. This is usually true of those which rise to five or six times normal voltage. When one phase becomes grounded, however, a steady-state overvoltage which is 73 per cent higher than normal exists on the other two phases.

It must be realized that even on an ungrounded 3 phase system there exists a normal voltage to ground on each phase which is 58 per cent of the line-to-line voltage. Under

normal conditions, the neutral is held at this ground potential by the equal conductor-to-ground or winding-to-ground capacitance Fig. 2. This is not a strong tie, however, and abnormal conditions shift the neutral ground relationship very easily.

Figure 3 shows how a solid ground on phase "A" shifts the ground point to the phase conductor. Normally, the basic insulation between any conductor or winding and ground is sufficient to withstand the 73 per cent increase in voltage to ground, experienced by Phase "B" and "C" in Fig. 3 and no immediate breakdown is usually experienced.

The detrimental effect of voltage stress on insulation is cumulative, however, and thus if the voltage stress is increased only slightly for long periods, some of the reserve life of the insulation is removed. Therefore, if the system is aged or deteriorated to some degree, actual failure can be experienced with only a 73 per cent increase in voltage stress as mentioned above.

The important point to be realized at this point is that by simply following proper system grounding practices, all of these destructive overvoltages can be limited or completely eliminated.

In addition to limiting overvoltages, however, proper grounding offers other important benefits to the plant engineer. Listed below are some of the prime benefits which have been realized by grounding a power system. Whether or not they can be experienced with your specific system requires engineering analysis.

The relative degree of appreciation of each of the following may vary with different voltage systems or under different installation conditions, but all are possible on some systems.

Some of these advantages are: safety to personnel is improved, ground fault location is simplified, operating and maintenance expense is reduced considerably, transient and steady overvoltages are reduced, reliability of service is improved and the frequency of occurrence of faults is reduced, and a greater degree of protection is afforded to the equipment connected to the system.

The subject of grounding a power system has, in the past, been a very controversial issue. The advocates of grounding are just as adamant in their convictions as are the proponents of ungrounded systems.

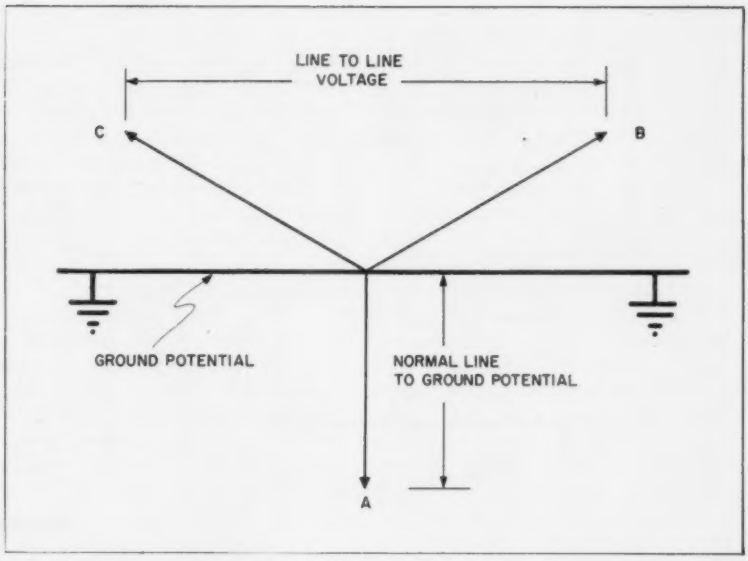


Fig. 2. Normal system with no fault. Neutral will float at ground potential

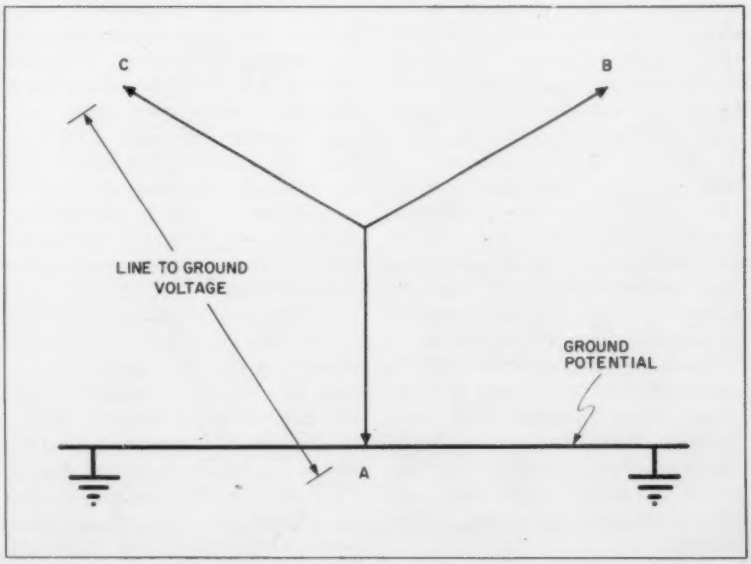
Although it must be admitted there can be arguments both for and against grounding, it must also be acknowledged that the installation of proper grounding equipment has, in the case of most industrial systems, resulted in a reduction both in the number and the severity of failures to electrical equipments. A presentation and analysis of these advantages and disadvantages will be found in the following paragraphs.

At this stage, let's clarify the term grounding. In power system work, reference is made to both system grounding and equipment grounding. These terms can be defined as follows.

System ground is an intentional connection to ground from one of the current-carrying conductors of a distribution system or the neutral point on a three phase system.

Equipment ground is a connection to ground from one or more of the non-current-carrying metal parts of a wiring installation or of

Fig. 3. System with ground fault on line A. Voltage to ground high on lines B and C



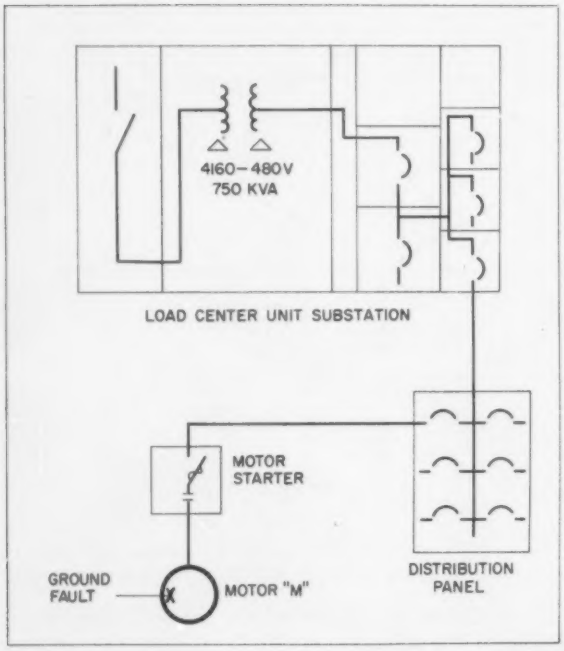


Fig. 4 Low-voltage system ground fault in motor circuit "M"

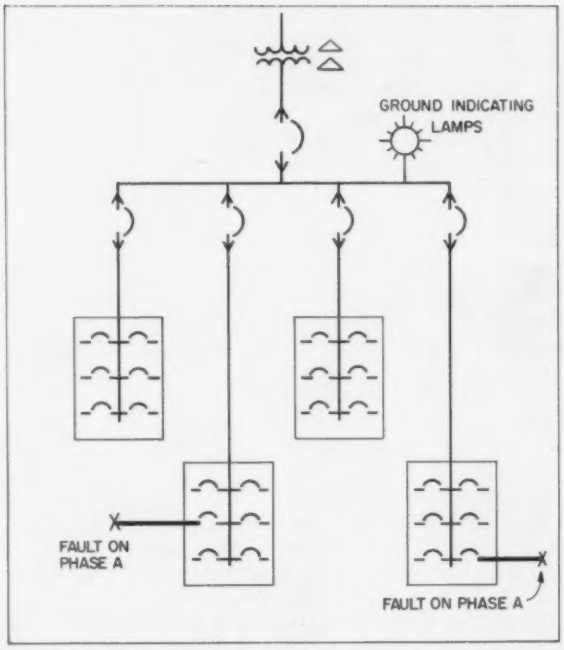


Fig. 5. Fault on A phase in two locations is troublesome

the apparatus connected to the system. As used in this sense, the term equipment includes all such metal parts as metal conduit, metal raceway, metal armor of cables, outlet boxes, cabinets, switch boxes, motor frames and metal enclosure of motor controllers.

Although the physical connections may differ between installations, the fact that equipment should be grounded for safety purposes is universally accepted and no further discussion will be made in this article concerning equipment grounds.

Certain power systems are nearly always grounded, for example, the 120 v lighting circuits encountered in the average home. This is done partially as a matter of convenience and, basically, as a matter of safety. Grounding of other electrical systems has been practiced more or less since the beginning of electrical power distribution. The methods and purposes of system grounding have not been universally uniform either between operating companies or within a given voltage class.

There are many different methods practiced in the grounding of three phase power systems. The most common method found in industrial plants involves grounding the neutral of the power source either solidly or through a current-limiting resistor.

References made in this article to a grounded system apply to systems grounded in this manner. Reference to ungrounded systems refers to systems where no intentional connection to ground is established under normal operating circumstances.

Below 600 v, the neutral is generally solidly grounded. This insures sufficient ground fault current to actuate self-acting trip devices usually utilized on low voltage air circuit breakers.

On systems with voltage ratings of 2400 v, 4160 v, or 13,800 v, overcurrent relays generally supervise the tripping of breakers. Common practice is to limit the ground fault current to some lower value, possibly between 600 and 2000 amperes, by grounding the source neutral through a resistor. Each individual system must be analyzed to determine the level of fault current best suited for proper coordination and protection.

The problem of whether or not the system neutral should be grounded and how it should be grounded persists. It is unfortunate that the problem has not had a complete understanding and engineering analysis which it deserves. As a consequence, the grounding of many systems has been based on previous experience, or merely opinion, and, therefore, system grounding practice is found to vary widely in older systems. Indicating a desirable trend is the fact that most newly installed systems conform to the modern neutral grounding practices.

Some of the advantages of grounding can immediately be visualized as we review usual operating procedures when a ground fault occurs both with an ungrounded and with a grounded power system.

When the first ground fault appears on an ungrounded power system, a very small amount of ground fault current will flow. Ground detection equipment is normally applied, which would indicate that a ground exists on the system, but this equipment will not give the location of the ground.

Figure 4 shows a typical arrangement of an ungrounded system. For the moment, let's assume that a ground exists at motor "M". The indication that a ground exists will appear on the ground indicating lamps, and it is now up to the maintenance crew to determine the location of such a ground.

Since this involves opening circuits serving production machinery, arrangements will have to be made in the production schedule to allow for such servicing. The next step is to follow a standard procedure which runs something like this.

First, the secondary feeder breakers are opened one at a time until the ground detection equipment indicates normal. This procedure isolates the feeder circuit on which the ground exists. Since there will no doubt be many motors and hundreds of feet of wire and cable connected to the feeder, the process of actually removing the ground has just begun.

The next step is to open branch circuits one at a time, then after the faulty branch circuit is located, the individual loads and motors will be disconnected one at a time until the search narrows to the faulty machine. It is obvious this can be time-consuming and if performed during normal production time, a large amount of production is lost.

Locating the grounded point under normal procedures indicated above is complicated enough, but it could be worse. Figure 5 indicates a system where a second ground has occurred on the same phase, only on a different feeder. There is no way of knowing that the second ground exists, so the maintenance crew would follow the normal procedures of opening one feeder at a time, to locate the grounded point.

Obviously, if a grounded feeder is open, the ground detection equipment gives no indication since the second ground still exists. The only way you can locate the grounds under such a double-ground fault condition is to open all of the feeders at once—and close them one at a time until an indication is given that the ground appears on the system again. One ground is then removed and the second is located by continuing the process.

Contrast this operation with that found if the system in Figure 2 were properly grounded through a neutral of a wye-connected transformer secondary winding. In this case, again assume a ground fault exists in motor "M". Only the branch circuit to motor "M" would be tripped off as the ground fault current would be sufficient to actually instigate a tripping operation, removing this circuit from the system.

The remaining system would remain intact and in operation. Although the circuit containing the ground fault is instantly isolated here, the equipment on this circuit must be now examined to find exactly where the fault occurred.

In spite of the obvious advantages of system grounding, some new systems are installed with the intent to operate ungrounded. Experience has shown that even with such operations planned, it is extremely practical to have secondaries of all new transformers connected in wye with a neutral bushing available, with the primary winding connected delta. If this precaution is taken, it is a simple matter to convert to grounded operations at any time.

Many existing systems may not have the neutral readily available. This need not deter from taking advantage of system neutral grounding. The neutral can be established on such systems by proper application of a grounding transformer to the delta connected system.

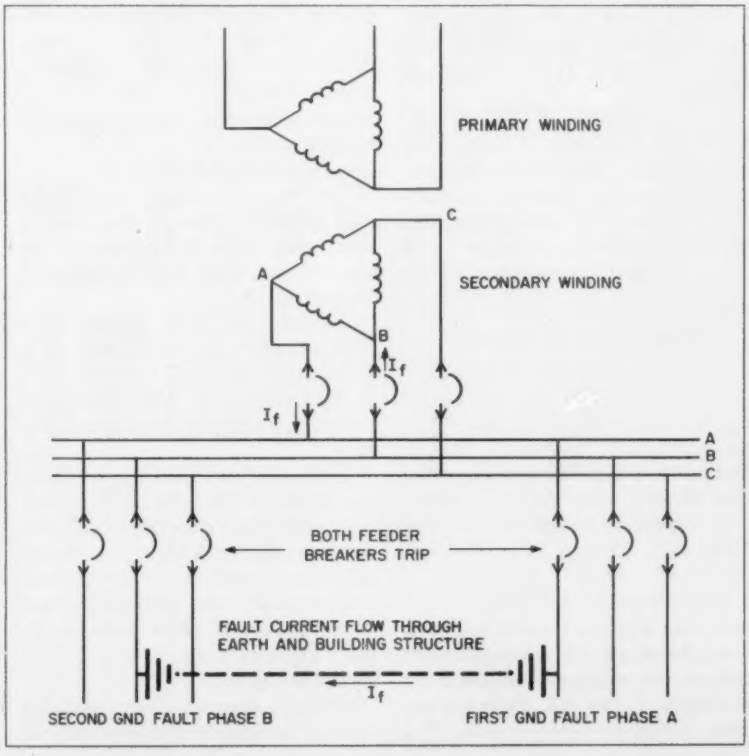
Although the selection of such a transformer requires an analysis of the existing power system, the rules applying to such an application have been clearly established by transient analyzer studies and are easily understood. Its rating depends on both the level of maximum ground fault current being established and the impedance of certain devices existing on the system.

To explain this further, establishing the neutral of a delta connected system solidly enough to avoid transient overvoltages dictates that the ground-fault impedance of the system, including impedance of the grounding transformer, must bear a certain relationship to the 3-phase fault impedance of the system.

These criteria determine the impedance limitations of the grounding transformer, and, in addition, the grounding transformer must, of course, be capable of carrying the ground fault current during the period of relay operation. From these factors, the requirements of the grounding transformer are established, and both the impedance and the current limitations may influence the size and cost of the unit.

From the above it is obvious that the relationship of electrical size to physical size of such apparatus may very considerably from system to system, thus no general cost relationships in dollars per kva will be attempted here, but can be readily obtained from a reputable manufacturer of such apparatus. To reduce the cost and physical size of the transformer, the unit is generally applied on the basis of a short time rating. **End**

Fig. 6. Double line-to-ground fault on ungrounded system results in outages of two circuits and high level fault currents which may cause damage to equipment



Putting Color to Work—

Make It Do Effective Public and Employee Relations Work

By **BURKE W. WOMBACHER**, Plant Engineering Consultant, California

SUCCESSFUL PLANT engineers are those who keep themselves informed and who make use of new trends and tools to increase the effectiveness of their organizations.

These are the fellows who are receiving the nod of appreciation and encouragement from that tough, cost-minded group known as top management.

Esthetics is defined by Webster as "the science or theory of the beautiful in art." In plant engineering we do not consider "art for art's sake." We think about the functional use of colors and design. Thus, color engineers today are not "artists or long-hairs," but are more aptly described as colorists.

It is very hard to determine just when the trend to coloring started. Remember the World's Fair in Chicago? Colorists were certainly at work there.

Then came the war and post-war years with hundreds of new plants springing into being, and colors began finding their place in industry.

It was probably about 1948, that the trend to the use of colors in industry began to receive serious attention.

Two-Tone Toy Factory

This new trend found about the same acceptance as the revolutionary idea of establishing preventive maintenance programs, and of course many big wheels took a dim view of silly ideas that only promised intangible savings of increased production through improved morale, etc.

I vividly remember a number of years ago when, as a plant engineer, I suggested to the plant manager that we two-tone paint all the plant machines. I can still hear his answer, "———— ———— No!! I want our machine shop to *look* like a machine shop and *not* like a ———— ———— toy factory." But I persevered and when I left this job the machine shop looked like a toy factory.

Most plant engineers, fortunately for industry, are "die-hards" who are accustomed to absorbing abuse like a sponge soaks up water, and they just keep plugging along.

Plant engineers probably rate as the best and hardest working salesmen in the world, and they are experts at selling intangibles to "tough customer" top management men, who are only interested in facts and figures.

How To Use Functional Colors

Alert plant engineers should act at once to master the use of colors. First they should increase their vocabulary so that such uncommon words as elegance, intensity, dignity, impact, symmetry, esthetics, become a commonplace part of their everyday language and thinking.

To the plant engineer, esthetics will primarily mean a wise use of functional colors and symmetry for plant layout, plant construction, and decorating.

Things have to be painted anyhow, so plant engineers need only adjust their thinking to guide them in their choice of colors and symmetry of pattern in designs and layouts.

How can you learn more about the functions of colors? I have been following this growing trend for many years, and a lot of my knowledge has come from studying literature from DuPont, Pittsburgh Plate Glass and other paint manufacturers. There is a wealth of this material available.

Also I learned from studying articles written by professional colorists and by personal contact with artists.

Here's a little example to help start your thinking: Try picking out one key machine in an area, something like your new tape-controlled milling machine. Try putting this in an area slightly apart, yet near the center of operations and paint it, let us say, a brilliant orange.

What Colors Can Do

Surrounding machines can be located in the usual manner, but you will have established an eye catching focal point. Workers in the area will take pride in the machine's and the department's appearance. The impact it will have on visitors will be surprising to see. You'll enjoy watching their startled reactions, and listening to their "What's that?"

Colors take a lot of learning, but you don't need to know them all.

There are about 150 visible colors in the spectrum. Multiply 150 x 10 x 10 for the hues and variations of these colors and this gives you about 15000 possible colors.

You probably need to know only about 100 of these for ordinary use.

Get yourself a set of children's color crayons and start experimenting; you'll find that is fun besides being of help in learning color functions.

Yellow and purple and their various hues appear to hold their position in space.

Red-orange in strong intensity advances most.

Blue in light value appears to recede the farthest.

Light green is an airy, spacious color.

For example, if the end walls of a long narrow room are painted a burnt orange and the sidewalls are

painted a light gray green, the room will appear shorter and wider.

Small rooms can be made to appear larger by painting walls and ceiling a cool color such as turquoise or light green.

Effect of colors on human emotions is another thing you will want to learn.

Red, gold, orange, and yellow in strong intensity are stimulating colors. Orange being the most exciting color of all.

Purple, blue, brown in deep tones are depressing and calming.

Pale greens, pale blues, and white are cool colors.

Maroon, brown, red and beige are warm colors.

Don't forget that black can be used effectively, too. Many big companies such as IBM are taking advantage of the value of black. Look at IBM's new trademark and compare it with their old one.

Esthetics also encompasses the field of visual communications. Trademarks, letterheads, and format of letters are among things being redesigned to have impact on their customer and public contacts. This demonstrates that esthetics has another value as a potent sales medium.

Try using the impact of black in writing your next engineering report. Type the body of your text lightly and type over twice on your important points so that they stand out good and black.

Also, if your typewriter has a two color ribbon, try addressing the boss in red. Who doesn't want to see his name up in colored lights?

Black is probably most valuable for its sharp contrast with white, but black also contrasts with shadings of gray.

Now that we know something about esthetics, here's how we can start making practical application of our new knowledge to our everyday problems.

1. Plant Construction. Make it a point to look around at the new plants in your area. Look at them up closely and study their construction.

You'll be surprised at what you find. Structures that look like concrete, brick, or stone, from a distance, are probably something else. The building materials field has made tremendous progress and the list of new building materials available is astonishing.

Got an order for a new metal building? Why use old style corrugated metal sheets, when for the same money or only a modest amount more, you can run up at least the facade with new materials that have the impact of modern dignity.

See the new ribbed panels and metal shapes that can be used for such work along with corrugated asbestos sheets, or by themselves.

Buildings are the package of your production operations. They can be used to transmit a message or convey an impression just as does the package containing your finished product.

As to office areas, look for ways to add a little extra decor. Tastefully located planters can do much to add a lot of charm and give pleasure to people.

Try round instead of square corners in the lobby and conference rooms. This gives an unusual effect without waste of usable space.

2. Plant Layout. Functional requirements place many limitations on your ability to decorate the layout of production areas, but there are ways such as setting a key machine apart from the rest and highlighting it as explained above.

3. Office Furnishing. Do some of the executives in your company still cling to their old mahogany desks when moving to new quarters? You'll be doing everyone a favor if you can sell him on the idea of getting a new one.

Many a man with bad temper and indigestion is just the victim of too much color contrast caused by working with white paper against a dark desk. Such fellows can be easily cured by giving them a gray desk top with a reflectance value of about 25 per cent.

4. Exterior Painting. In California, we generally use colors such as light greens, tans, sandstone, that are selected mainly for their high reflectance value to avoid absorbing heat from the sun.

Also they are pleasing to the eye and reflect the airy style of California progress and living.

5. Interior Painting. This is one of the most fertile fields for the colorist.

a. Lobby and Main Entrance. Good seeing is not a necessity here and you can give free rein to your imagination. Treat the lobby as your first line of attack on a customer and use the impact of the colors to influence him favorably.

Don't use dull colors if you want to impress him that you are a lively, progressive organization.

You also wouldn't use wild, frivolous colors if you were an investment firm that wanted the customer to entrust his funds to you.

b. Offices. Remember that conditions that aid in seeing are of help to people. Neither light nor color can exist one without the other. Bright, cheery, attractive colors pay dividends.

Colors should be chosen tastefully and should have appropriate dignity. Any wild, blazing colors should be avoided. Pale greens, blue tints, beige, peach, and sandstone, are all good colors.

c. Women's Restrooms. These rooms call for soft colors of rose, yellow, or peach, designed to give a soft, warm feeling. Women especially appreciate a nice environment.

The psychological effects on people should influence color selections all through the interior. Remember that the same colors that are used to treat the mentally ill can also be used to influence healthy people.

d. Men's Restrooms. These rooms are best designed and colored to provide for easy wall washing and cleaning. Grays, greens, and white are colors commonly used.

e. Cafeterias. They can be made either warm or cool depending on location. Rose, peach, pale green, and yellow are good colors. Avoid purple, blue, and even white, if you want people to eat heartily.

f. Ceilings. In office areas use white, or white with a tint of the wall color if suitable. In manufacturing areas, you can't beat white for its light reflectance value.

g. Dados. Dados are outmoded for office areas, even if a chair rail is used around the walls, but they are still very valuable in shop areas. Colors chosen for the shop should

(Continued on page 228)

THIS IS EL SEGUNDO where this well-manned plant engineering staff does everything that makes production possible. It builds the plant, installs the facilities, performs maintenance, designs equipment and machinery, and does plant layout

This Is Plant Engineering at Douglas

A DETAILED DESCRIPTION of the physical makeup of Plant Engineering at the El Segundo Division of Douglas Aircraft Company would be rather meaningless without first defining its scope of operations and the numerous responsibilities involved. It would be like describing a new automobile and leaving out the operational specifications. For in this company, plant engineering has reached its proper status.

This department *does not* design, tool for, and produce a specific product to be sold. But from the technical standpoint, it *does do* everything that makes this design and production possible . . . everything from building the plant and installing the facilities, down through complete maintenance, plant modifications when necessary, the design and manufacture of special machines and equipment, provision of durable perishable tools, plant layout, transportation, and the handling of many and various special assignments. When and if contractors from the outside are needed on any of these projects or activities, the Douglas Plant Engineering Department develops the specifications, in some cases draws the plans, selects the contractor, supervises and inspects his work, and finally accepts the finished job.

How They Work

A prime example of what this well-organized plant engineering department can accomplish occurred a few years ago when the Douglas El Segundo Division needed to expand its production facilities for Navy airplanes. An unused (at the time) and somewhat dilapidated aluminum reduction plant, located on a 180 acre plot of ground 10 miles from the parent plant, was chosen as the expansion site. At this point in the plans, the entire project was handed to the Douglas Plant Engineering Department for development. No strings were attached. Management's only instructions were . . . "get this new facility rolling as quickly as possible."

Because of the rush, the modification and tooling of the old aluminum plant was accomplished in phases. In less than 90 days, the first production departments were moved in and started to work. In less than a year, the old buildings had been converted into one of the nation's most modern and efficient aircraft and missile production facilities, including 1,670,000 sq ft of covered area.

Dozens of major permanent airplane production tools and machines, many of them not available on the commercial market, had been designed, manufactured, tested, and installed. New techniques for tool storage and handling had been worked out and the facilities installed. Revolutionary ideas in plant layout, making many major production departments totally independent of other departments, were included. A transportation system,

ENGINEERED BY THESE MEN, shown here in a staff meeting, both El Segundo and Torrance Facility are kept in tip-top running condition from floor to roof

including many specialized trucks and trailers, had been scheduled, equipped, and was ready to roll.

As a final touch, all remaining production departments were moved into the new facility over a single weekend. Employees that were going to the new location left the parent plant on Friday evening and reported at the new plant the following Monday.

It is more logical to describe the Douglas El Segundo Plant Engineering Department as "tight knit," rather than to say it is a simple organization. While lines of responsibility are clearly defined (as shown in the accompanying organization chart), so many ramifications are involved that the utmost in departmental cooperation is required at all times.

More often than not the work being done in one section must dovetail with work being done by other sections. Furthermore, no "simple" organization could assume so much responsibility in a plant with 25,000 employees, covering 363 acres in area, and with more than 4,500,000 sq ft of covered space split between plant sites located 10 miles apart.

The numerous total responsibilities vested in Plant Engineering necessitate a high degree of independence. The only direct line of authority into the department is from management, through the Works Manager, and thence to the Chief Plant Engineer. Delegation of responsibility and authority beyond this point is the duty of the chief plant engineer. But as this authority is handed downward through the various sections, the degree of independence maintains. General foremen, foremen, assistant foremen, and group leaders are not hampered by restrictions which might impede optimum plant engineering practices.

Projects, work orders, etc., are divided into "major" and "minor" categories for the sole purpose of determining from which level of authority approval for their accomplishment must be obtained. But there is no sharp line of demarcation between a "major" and a "minor" project. A lot depends upon the nature of the work, its urgency, and whether or not it constitutes an emergency expenditure.

Capital expenditures, of course, require management approval, but many other expenditures which may exceed some of the capital expenditures in amount can be approved by a general foreman if the nature of the work warrants it. Here again, independence of action, tempered by good judgment and common sense, prevails. It is a part of the responsibility vested in Plant Engineering to spend money wisely and well.

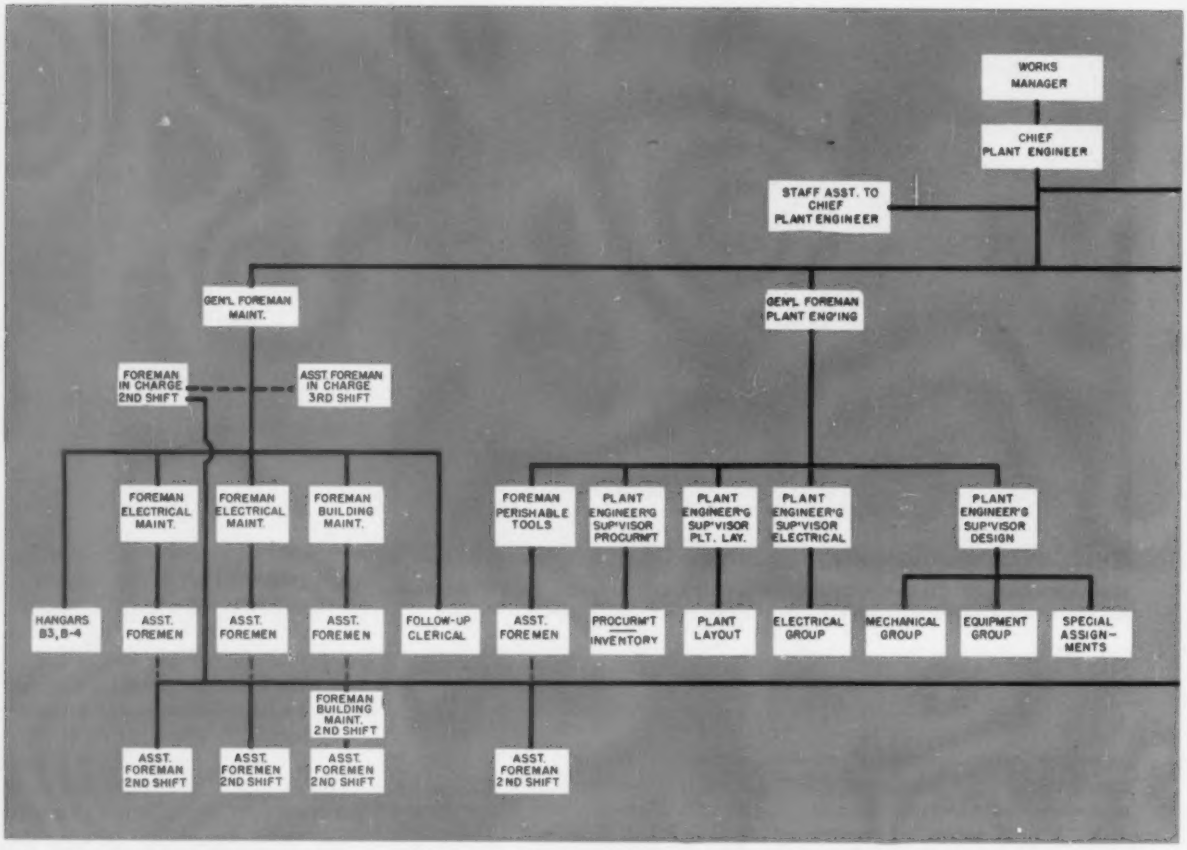
As the Plant Engineering Organization Chart indicates, the Douglas El Segundo Plant Engineering "Sub-Division" (it is referred to as a "sub-division" rather than a "department" at Douglas) is literally "split down the middle" between the two ten-mile-apart sites which constitute the major facilities of this company division. This is in reality an extension of the independence of action with which the entire subdivision is endowed. The one line of authority between the two locations exists between the Chief Plant Engineer at the parent location and

Richard L. Skelton

Dick Skelton was born in 1917, a Native Son of California. He attended both grade and high school in Los Angeles, then attended the University of California at Los Angeles and University of California. He was graduated with a degree in Mechanical Engineering. Mr. Skelton has spent virtually his entire working life at Douglas. He started as a part-time draftsman even before finishing his education. He became a plant engineering supervisor in 1942 and a plant engineering general supervisor in 1951. He was made Chief Plant Engineer in 1954. Dick is married and the father of two children—both girls.

Lynn D. Bisher

Lynn Bisher is Assistant Superintendent of Plant Engineering and in charge of plant engineering at the Torrance Facility. He was born in Albany, Oregon, in 1902. He went to work for Warman Steel Casting Co. in 1924 as a millwright and became foreman of the maintenance department during his first 10 years. Lynn joined Douglas in 1934 as a maintenance man and rose through the positions of assistant foreman, foreman and general foreman of maintenance. In 1950 he was appointed general supervisor of plant engineering and maintenance. In 1954 he was put in charge of plant engineering at Torrance.



This is the plant engineering organization chart for both the El Segundo plant and the Torrance Facility of Douglas Aircraft

the Assistant Superintendent of Plant Engineering at the other location. But this line of authority is more complex than it first appears, for it implies complete and total cooperation between the locations to avoid duplication of efforts.

Who Does What?

General foremen or supervisors are in charge of the specific sections of the Plant Engineering Sub-Division, and are answerable, in turn, to the Chief Plant Engineer. The three main sections of the subdivision are Plant Engineering (General), Maintenance, and Transportation. A somewhat specialized group which handles building design, construction, and modification, is a sub-section of the Plant Engineering (General) section. A brief description of each of these sections, and the types of work accomplished, will provide a more concrete picture of the scope of operations involved.

Plant Engineering (General), controls perishable tools, procurement, plant layout, electrical design and installations, and mechanical design and installations. The subsection handles all construction. Each of these departments within a section is headed by a foreman or supervisor who is answerable to the general foreman of that section.

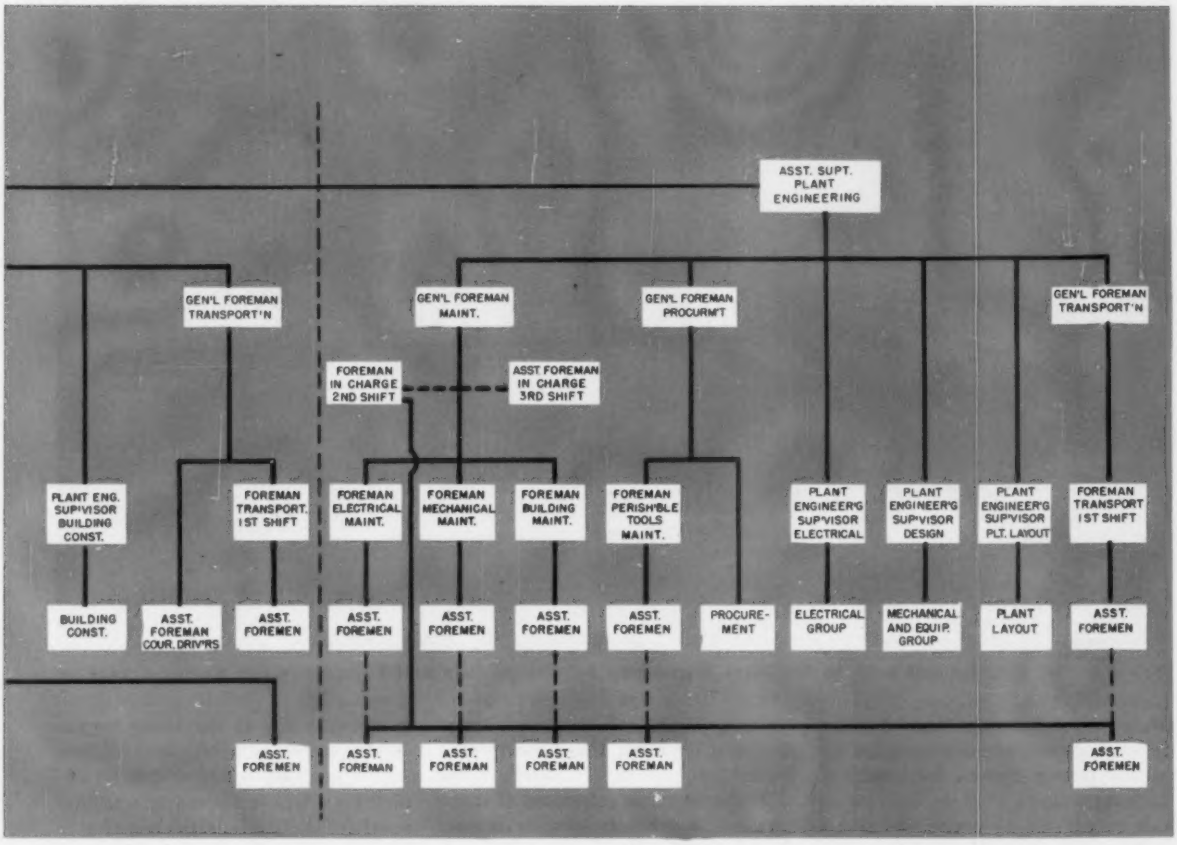
The foreman in charge of tools is responsible for all the perishable and durable tools used in the plant. He must issue the orders for their procurement and follow through to make certain that they are ready at hand when needed. He controls the tool cribs from which the tools are issued, and the manner in which the tools are withdrawn for use. He is responsible for the maintenance of all perishable and durable tools, and for their final accounting. This is a sizable task in a plant where perishable tool costs total several million dollars annually.

Supervisor in charge of procurement, as the name implies, is responsible for economical procurement of all the necessary machinery and plant equipment used by the entire plant. While he does not always specify the items to be purchased, he makes certain that all items are purchased to specification and from the most economical reliable source. He works with plant purchasing.

Plant Layout—Big Job

The supervisor in charge of plant layout must allocate all floor and yard space for most efficient results. He is responsible for the placement of machines and equipment in each department, and must supervise and control all re-locations necessitated by a move. He must take into consideration material flow patterns and production line sequences and make the layouts accordingly. This is no small task in an airplant where continual model changes or model modifications of the production product (airplanes) are in progress.

To facilitate plant layout work, a large plant layout board is mounted on one wall of the main plant engi-



The dotted line shows the physical separation of the organizations in the two plants although they cooperate on many jobs

neering office. This board is drawn to scale, and on it appears outlines of every square foot of available space in the plant, including partitions, obstructions, and mezzanine and balcony space. Two-dimensional templates are used to indicate every piece of equipment in the plant. These cutouts are scaled to size and are mounted on the layout board. They are mounted in the exact position the actual equipment will occupy in the plant.

Power Distribution Boss

The supervisor of the Electrical Design Group is responsible for all electrical equipment and power distribution in the plant. The scope of this responsibility is best indicated by the fact that power consumption in the plant is equivalent to that used by a city of about 50,000 population. The parent plant alone consumes some 7,500,000 kw hr per month. Some 16,000 motors of all sizes are employed at the two locations. This Electrical Design Group must specify or design all electrical equipment used.

When needed equipment is not commercially available, it is designed and built in the company shops. The Group must arrange also for adequate and efficient power distribution within the plant, and for conversion of power where necessary. Numerous d-c and 400-cycle power supplies are used for processing operations and functional testing of production and experimental components.

As an example of an improvement in power distribution worked out by this group, power in the machine shops is supplied to the machines by a plug-in overhead duct sytem. The same applies to the modular panel systems used in the large electrical inspection and testing laboratories. Rather than permanent test panel set-ups, modular test panels are merely "plugged in" when needed, either singly or in groups to form a production run test panel.

The supervisor of the Mechanical Design Group has three sub-groups under his control—the Mechanical Group, the Equipment Group, and the Special Assignments Group. The responsibilities of, and what these groups are supposed to do, is quite obvious. What they *have done* would require many pages in a book dedicated to "Firsts" in plant engineering practices. Only a few typical examples can be mentioned here. . . .

What M. E. Group Does

They designed the installation for the nation's largest single spar cap mill, designed and installed the nation's largest single anodizing set-up, designed and built a heavy duty routing motor that is rapidly replacing other routing motors, designed and built the first pantograph routers that could route their own patterns from a photo template. Many commercial products have been installed or improved in a manner to influence the original manufacturer's future designs. Production rights on

Typical project planning and built by the Plant Engineering Subdivision. It's world's largest single aluminum anodizer

dozens of new designs developed by these groups have been assigned to outside manufacturers for commercial production.

If an outside observer was asked to write a motto for these groups based on their past performance, it would have to go something like this . . . "Don't do it the conventional way. Find a better way."

Maintenance Is Versatile

The Maintenance Departments of the Douglas Plant Engineering Sub-Division are totally responsible for maintaining all equipment in the plant and the buildings themselves. "Maintenance" is rather a limiting word to describe the operations in these departments, for in addition to straight maintenance work, design, developmental, manufacturing, and production operations (as related to plant engineering projects) are also performed. A typical example is the cold fluorescent light extension cords described in a recent PLANT ENGINEERING article. (p. 98, Aug. 1957). These lights were developed by the Electrical Maintenance section and are now being manufactured on a production line basis in sufficient quantities to serve all company needs. The maintenance shops are also used for manufacturing or building much of the new equipment designed by Plant Engineering personnel.

Maintenance is composed of three sections, each equipped with its own shops and facilities—the mechanical and plumbing section, the electrical section, and a section for carpentry and building maintenance. Branching out from these shops, area maintenance exists throughout the plant. Calls for maintenance enter a central dispatcher's office. The work is then scheduled and dispatched to the areas where it must be performed.

There are more than 7,000 major machines (costing $1000 or over) at the two locations. Each of these machines is folder-indexed in a master file. The folder on each machine carries a complete history of its operation, including all breakdowns and maintenance operations which cost $20 or more. These individual machine histories prove extremely valuable in the department's well-defined preventive maintenance program.

In carrying out this program, each one of the more than 7000 machines is individually inspected once a year. This inspection report goes into the machine folder along with the other data covering its history. Then once each year these machine folders are carefully reviewed for machines which are costing too much to operate due to recurring breakdowns, obsolescence, etc. When such a machine is found, it is scheduled for a trip to the major machine overhaul shop. Here it is completely rebuilt and modernized if necessary. When it returns to the production line, it is in all respects as good as a new machine. This major machine overhaul shop also modifies many newly purchased machines to make them more suited to aircraft parts production.

How Maintenance Buys

The Maintenance section of Plant Engineering, like the other sections, is responsible for ordering all its own supplies, replacement parts, and equipment, for locating logical procurement sources, and for following up the order once it is placed. Paper work is minimized insofar as possible. On major machine repair work, work orders totalling $20 or more are entered on a "Breakdown Card" which will eventually become a part of the folder covering the machine on which the work is accomplished.

Lubrication charts listing the frequency of lubrication and the types of lubricants to use are mounted on each machine. Here again simplicity is in order, but it was not obtained

without effort. A few years ago, more than 50 different lubricants were used on the thousands of pieces of equipment throughout the plant. But by systematic research and the development of specific lubricant specifications, the number of lubricants now in use has been reduced to ten.

By working hand-in-hand with other sections of Plant Engineering, especially the electrical and mechanical design groups, and the special assignments group, the Maintenance section has been able to simplify many of its own tasks. A typical example was the development of an airless portable paint spray unit for maintenance painting as described in a recent issue of PLANT ENGINEERING (p. 102, Sept. 1957). Many innovations in in-plant power distribution serve to reduce maintenance work. The huge compressed air systems in the two plants have been simplified by spreading out the compressors to various locations, then joining them in continuous loops to minimize line losses, water accumulations, and line inspection and maintenance.

Transportation—Big!

The third and last major section of Plant Engineering, the Transportation section, is so huge and widespread in its operations and responsibilities that it is forced to operate almost like a separate entity. But by close cooperation, the operations of this department are dovetailed very nicely with all other plant engineering activities.

The General Foreman of the Transportation section is totally responsible for the operation and upkeep of 74 trucks, 10 buses, and 101 automobiles, which travel over 3 million miles annually. In-plant transportation facilities are also under his supervision, as well as a large group of chauffeurs for driving the company passenger automobiles. He must operate and maintain scheduled transportation facilities between the two El Segundo Division plants, with the other two large Douglas plants in the same area, and with outside contractors, many of them several hundred miles distant.

The Transportation section operates its own repair and maintenance shops for everything from minor servicing to major overhaul and body rebuilding. New equipment is often modified in these shops to suit it better to specialized haulage work. All paper work involved in the purchase of auto and truck licenses, and in the payment of various vehicle taxes, is handled in the department. Preventive maintenance is accomplished by established 10,000, 20,000, and 50,000 mile inspections of every piece of rolling equipment.

In this section again, paper work is minimized insofar as possible. Minor service and repair jobs are handled in a routine manner. Major repairs are charged against specific equipment. Capital expenditures, of course, require approval from management, but emergency expenditures (such as might accrue from an accident on the road) can be approved immediately by the General Foreman.

Despite its widespread operations, involving a lot of heavy haulage and the supervision of many "U-Drive" company cars, the Transportation section can point with pride to its safety record. For the past three years it has been listed among the top three in safety by the National Safety Council, Greater Los Angeles Chapter. In 1957, it won the Sweepstakes Award, a permanent trophy. The accident rate for the past year was 0.70 for each 100,00 miles of travel.

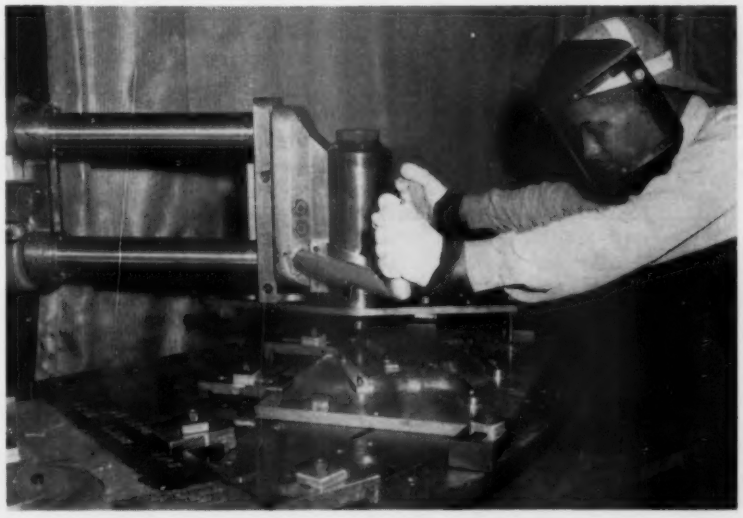
While independence of action, unhampered within logical limits by pre-set monetary considerations, is a major characteristic of the Douglas El Segundo Plant Engineering Sub-Division, it should be noted that this independence is tempered by the responsibilities involved. Any person who can authorize or instigate an operation is totally responsible to a higher authority for his judgment in the matter, for completing the operation in the least time and at the lowest cost, and for the consequences.

Cooperative Meetings

The natural result of this responsibility is very close cooperation between the various sections of Plant Engineering, for in many cases the work accomplished by one section is dependent upon, contributes, or must dovetail with the work accomplished by another section. This cooperation is enhanced by periodic meetings between the heads and the sub-heads of the various sections. At these meetings, pending jobs are discussed and scheduled, priorities are established in consideration of emergency or down-time requirements, assignments are made. These meetings are a place where all the work being done, or to be done, by each section can be viewed as a whole, a perspective obtained, and progress plotted.

All contributing work is timed and dovetailed. These meetings are moderated by sufficient authority to iron out any conflicts that may occur. **End**

Pantograph router designed and developed by the Mechanical Design Group of Plant Engineering. This machine "routes" its own pattern from a photo template



How To Get What You Need in Pumps

II. Investigate Standard Casings Before Specifying Specials

By J. A. CABLE, Centrifugal Pump Dept., Allis-Chalmers Mfg. Co.

CASINGS OF centrifugal pumps provide water passages to and from the impeller. They must be strong enough to safely contain the pressure which the impeller produces, plus any suction inlet pressure. How can one be sure they will be strong enough?

In order to assemble the impeller and rotating parts within the casing it is necessary that it be split in some manner. This means that strength of the casing casting material plus that of the bolts holding it together must receive consideration. Since the vast majority of pumps are single or double-suction centrifugals, we will concentrate on the casing design of these two basic types.

In this article the word "casing" is used to mean either or both of the upper and lower halves of a horizontal-split, double-suction pump casing, or a single-suction pump with two nozzles in one casing, or units where the suction nozzle is in a cover—that is, a separate piece.

Cast iron is rated according to tensile strength. The usual practice is to design with a safety factor of 10 so that tensile stresses at test pressures are not over 2500 psi when using 25,000 tensile iron, 3000 psi for 30,000 tensile, etc. The bolting material is also selected to allow a generous safety factor. This factor averages nearly 5 inasmuch as it is typical to have bolt stresses kept below 15,000 psi with 75,000 tensile strength bolting. In each case the figures cited are the limits within which the hydrostatic test pressure is confined. Since standard practice is to make this hydrostatic test at 150 per cent of maximum design working pressure, the corresponding safety factors versus working pressures are that much enhanced.

All of this leads up to the point that standard casings are generously designed with the standard pressure limitation for each pump casing at least equal to the maximum head that the pump is capable of producing. These limits are usually published by each manufacturer in their respective price book catalogs.

Even if not stated, it is safe to assume that a casing will be good for the maximum head produced by the maximum diameter impeller. When unusually high suction conditions exist casing casting and bolting strengths should be checked. However, when your rating does not include any appreciable suction

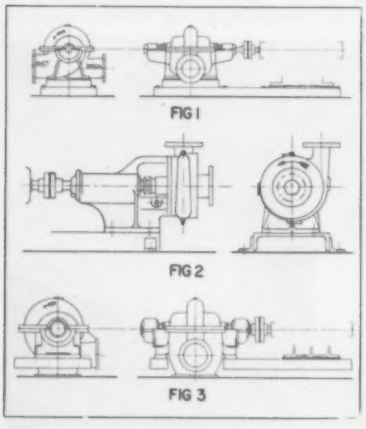


Fig. 1. This is a typical horizontal-split, double-suction pump. Fig. 2. Typical vertical-split, single-suction pump. Fig. 3. Horizontal-split, double-suction pump with bottom suction. Bottom suction is available in the large size units

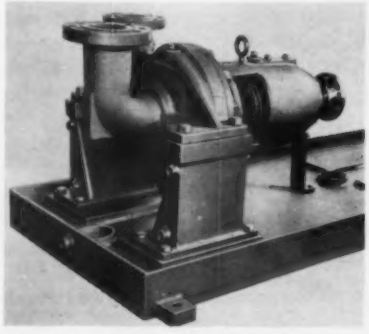


Fig. 4. Vertical-split, single-suction pump with top suction. See Table II

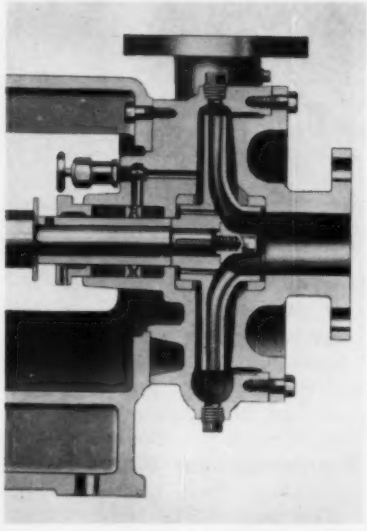


Fig. 5. Cross-section of a vertical-split pump with split in front of impeller

Table I. Pressure limitations of 150 lb flanges and 300 lb flanges under different temperature conditions, 0 to 800 F

Temp. Deg. F	Pressure Limitations[1] 150 lb Flanges	300 lb Flanges
0 to 100	230 lb	600 lb
150	220	590
200	210	580
250	200	570
300	190	560
400	170	540
500	150	500
600	130	445
700	110	380
800	92	300

[1]Since suppliers used various alloy steels, these limits fluctuate slightly especially in the 300 lb series.

Table II. Pros and cons relative to both horizontal-split, double-suction castings and vertical-split, single suction units

Point of Comparison	Horizontal-Split, Single-Suction	Vertical-Split, Single-Suction
Working Pressure Limits	Up to 175 lb quite typical with each size varying to suit pump's range. Some as high as 400 lb with special modifications. Modifications quite expensive. Bolting is in irregular pattern making additions or size changes elaborate. With the casing split horizontally machining more difficult when special casting materials applied.	Standard range also geared to each size pump's pressure range with 175 lb typical. Modifications to extend limit to 400 lb available in many sizes. In those cases where standard is limited by bolting stresses the modifications are less expensive as the round joint flange is more readily adaptable to changing number and/or size of bolts. In special materials less expensive to modify because pieces have mostly round machined surfaces without interrupted tool cuts.
Temperature Limits	0—20 F up to 250—300 F Varies somewhat with manufacturer depending on bearing design, type and location and also stuffing box arrangements possible. If stuffing boxes water-cooled limit may be extended somewhat. Colder temperature possible with special alloys to prevent embrittlement.	Varies with pump type. Average close coupled design unit limited 0—20 F up to 212—250 F. (Sometimes limited to 212 maximum if unit built exclusively with mechanical seals.) Frame mounted design. 0—20 F up to 250—300 F with grease-lubricated bearings, and as high as 550 F with oil-lubricated bearings. Above 350—400 F steel casings are advisable. Where centerline supporting feet are preferred, special types such as refinery process pumps are available and used for as high as 700—800 F. See Fig. 4.
Nozzle Positions	Small sizes up to 12 in. usually side-suction, side-discharge. Larger units also available with bottom-suction, side-discharge in some sizes. These will vary considerably between different companies. See Fig. 3.	End suction standard with discharge standard vertical. Easily changed to side bottom or side top in many sizes. Some special types such as refinery process also can be had with top vertical suction brought in with a 90 deg turn as a part of the pump. See Fig. 4.
Direction of Rotation	Optional.	Usually fixed as either clockwise or counter clockwise with variation between pump suppliers. Very few give you an optional choice.
Availability for Maintenance	Horizontal split allows removal upper half with ready access to rotation element.	Vertical split comes two ways: Split in front of the impeller; these best installed with short spool in suction line to allow access but further dismantling necessary to remove rotating parts. See Fig. 5. Split in back of the impeller; if installed with maintenance in mind can be worked on quite easily. Especially if a spacer type coupling is employed. This is standard on refinery process pumps and special types for slurry handling. See Fig. 6.
Foot Location	Cast integral with casing, therefore not alterable. Extended below casing which accounts for temperature limits because expansion makes alignment a problem.	Feet either part of frame or motor feet used on close coupled units. This permits discharge nozzle variations indicated above. Special refinery process types have foot on horizontal centerline as in Fig. 4.
Choice of Enclosed or Open Impellers	Possible by substituting wear plates mounted in wear ring fits. Also available with adjustable axial clearances rings which admirably handle low solids concentrations.	If casing includes both suction and discharge nozzles enclosed impellers usually not offered. If casing split with companion suction cover this cover can be modified for use with open impellers. See Fig. 7. If you ever want to change from closed to open impellers be sure to get this type originally.

pressure the pump's casing takes care of itself.

In many cases the standard pressure limits can be extended by use of special materials and changes in the number and/or size of bolts used. However, abnormally high pressures can make it necessary to switch pump selections to get a suitable strength casing. Since pressures do effect pump selection to such a degree it is well not to ask for more hydrostatic test pressure than is necessary.

Flanges — Part of any casing standard is the design and rating of its suction and discharge flanges. With standard cast iron castings there are two series of flanges in common usage and their nomenclature is a bit misleading at times. ASA flanges are classified as 125 lb and 250 lb series—but those numbers are their limits when used for steam.

For cold water and other liquids under non-shock conditions 125 lb series flanges up to 12 in. are capable of containing 175 lb of liquid pressure. Fittings from 14 in. to 24 in. are rated 100 lb with steam or 150 lb cold water non-shock. The 250 lb group is good for 400 lb liquid pressure.

When steel flanges the common series are ASA 150 lb and 300 lb. These are rated on a sliding scale depending upon the temperature of the material contained. Listed in Table I is typical temperature vs. pressure information.

In putting flanges on standard casings the above limits are heeded. Inlet pressures seldom require special suction flanges. Usually they are 125 lb on cast iron casings. There are, of course, a few cases where a pump may cross these border lines. When this is the case the flanges need special consideration.

For example a pump's range of heads goes from 300 to 500 ft. A pump in the lower range may have a standard iron casing with a 125 lb discharge flange. However, if the discharge head exceeds 175 lb

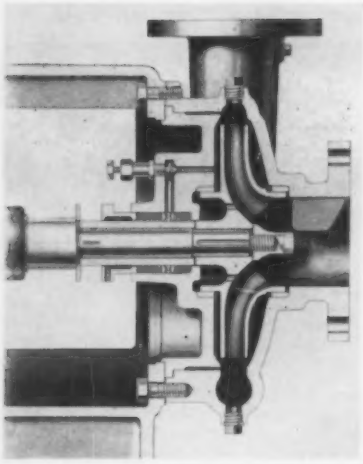


Fig. 6. Cross-section of vertical-split pump with split in back of impeller

(which equals 405 ft at a specific gravity of 1.0) the casing should be modified to include a 250 lb discharge flange. This modification is quite expensive for several reasons.

First a 250 lb flange may not be the same size as the 125 lb flange. If this is the case the casing pattern must usually be altered. Second, if the standard casing is a stock item, the special part must be covered by a different drawing. This means there will be changes in tooling and the casing will be a one-at-a-time manufacturing item rather than part of a stock order for a number of duplicate pieces. When the pressures handled are in the range requiring these changes they are, of course, mandatory and a necessary part of the total cost.

In many cases pump customers have piping standards where, for uniformity, they use 250 lb piping throughout a plant. They then ask for 250 lb flanges on both suction and discharge end of a casing even though the application pressure in an individual case may not demand such heavy construction.

It would be well to consider these pump purchases individually. Compare the cost of a standard casing and special adapters in the piping (to permit the use of 125 lb flanges on the pump connecting to 250 lb piping) with the extra cost of having a pump specially built with either one or two 250 lb flanges.

If the standard casing material is steel, similar casing standards would apply with the discharge being suitable for average use. Since steel casings would generally be standard only on higher pressure services, they usually have at least 300 lb discharge flanges.

When working with small pumps it often is standard practice to use screwed rather than flanged connections. Pump builders will usually describe their own set of standards on this point in their literature. Generally nozzles up to 3 in. size may have screwed connections.

Single Vs Double Volute — Most standard casings in either single suction or double suction pumps have a single volute. With

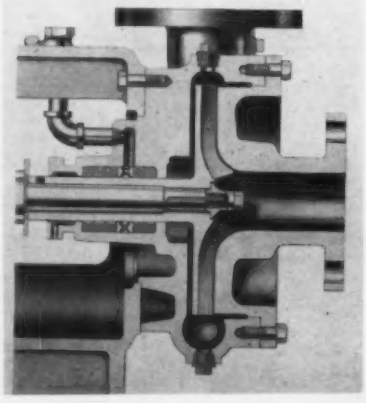


Fig. 7. This is a section of a single-suction pump with an open impeller

the gradual upward extension of head ranges, double volutes are growing in favor in some cases. Figure 8 illustrates what a double volute does for you. It amounts to this—if every impeller was asked simply to operate at its highest efficiency, double volutes wouldn't help much. Even with the variable passages around the impeller at the best point of efficiency, the design inherently results in a balance of pressure.

However, if the pump operates over an extremely wider range of heads and capacities, the double volute casing design affords better shaft, bearing and sleeve life and better packing (or mechanical seal) life. This is particularly true when the head per stage exceeds 300 or 400 ft. On very high head pumps producing 500 to 600 ft in one stage, double volute casings are often standard equipment.

Making a special double volute casing for one particular application is out of the question because it requires a complete new casing casting. However, if you have a wide operating range and heads produced exceed 300 ft, it would be well to seek double volute casings when they are available.

Choice of Materials—The casing usually gets last consideration for special materials because it is the largest part of the pump. Even with chemically active liquids one often finds pumps built with standard casings combined with special fittings for the small rotating parts.

The pumped liquid's ph value generally is the determining factor in this decision. Generally ph in the range of 6 to 9 permits cast iron casings to be used with bronze fittings. Below 6 one generally specifies bronze casings and fittings, with all-stainless steel getting the nod below 3 or 4. At the other end of the line iron casings lose out to stainless steel when the ph swings

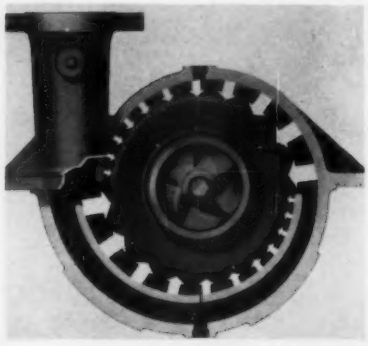


Fig. 8. This sectional drawing shows how design of a double-volute pump inherently results in a balance of pressure

seriously alkaline (over 9-10). No bronze should be used.

The same horizontal, split-double-suction versus vertical, split-single-suction, choice enters this picture. If you're in the range where you have a choice of pump types the vertical split pump will usually result in the least costly addition for a special material casing.

In some applications it is desirable to have a casing which will not crack open if struck by flying material from a nearby explosion. Neither should the casing crack into pieces if it fails internally.

In the past it has been the practice to specify carbon steel casings for such installations.. Metallurgists have now produced cast iron having steel-like properties. **End**

All Engineers Luncheon

AIPE-Sponsored Event at the Maintenance Show

Fig. 1. Dr. Kenneth McFarland, featured speaker at the luncheon. Widely travelled and recognized as a speaker of outstanding ability, he holds degrees from Kansas State Teachers College, Columbia University and Stanford University. He holds recognized status in the fields of education, business, farming, civic leadership, industrial counsel, personnel and public relations counsel

FOR THE FIFTH consecutive year, the All Engineers Luncheon is being held during the Plant Maintenance and Engineering Conference and Show. Sponsored by the American Institute of Plant Engineers, the luncheon is scheduled for January 28, in the Stock Yard Inn, Chicago, at 1:00 p.m.

At the luncheon, plant engineers from all over the country will gather to renew acquaintances, enjoy a good meal, and relax from the rigors of attending the Conference sessions.

Principal speaker will be Dr. Kenneth McFarland, Educational Consultant and Lecturer for General Motors Corp., and Educational Director for the American Trucking Associations, Inc.

Recently honored as both the "Nation's Number One Air Passenger" and "America's Outstanding Salesman of 1957," Dr. McFarland was also shown to be the nation's foremost speaker, according to a survey conducted by the U.S. Chamber of Commerce.

Topic of his address will be "The MAN in MANagement," and it promises to supply every plant engineer with valuable insight into his own position.

Joining Dr. McFarland at the speakers' table will be the newly-elected national officers of the American Institute of Plant Engineers, who will be presented to the members and guests of the Institute at the luncheon.

Fig 2. John M. Waligora, President of American Institute of Plant Engineers

Fig. 3. Dr. A. J. Cardall, as he spoke at last year's All Engineers Luncheon

If you're coming to the Maintenance and Engineering Conference and Show, save Tuesday noon for the All Engineers Luncheon. And, to save yourself half a buck, send in the reservation request that appears on this page. Tickets purchased at the door will be $6.00. **End**

James F. McCracken
Ace Carton Corp.
5800 W. 51st St.
Chicago 38, Illinois

Kindly send me ..... tickets for the All Engineers Luncheon of the American Institute of Plant Engineers to be held at the Stock Yard Inn, Chicago, on Tuesday, January 28, 1958, at 1:00 p.m. Price: $5.50 per person.

☐ Check ☐ Money Order is enclosed for the reservations indicated above. (Make check or money order payable to the American Institute of Plant Engineers.)

Name	Company Address
Company	City — State

Fig. 1. Operator polishes tubing on a backstand unit. View shows the coated abrasive belt, contact wheel and dust collector. These and other parts on an abrasive belt machine when properly maintained will give many years of satisfactory service. (Guard on machine is open for photographic purposes only)

How To Improve Abrasive Belt Performance

Vital Parts Servicing Extends Belt Life, Assures Even Wear

By R. W. REED, Engineer, Minnesota Mining and Manufacturing Co., St. Paul, Minn.

GOOD EQUIPMENT maintenance practices have a definite effect on coated abrasive belt performance. Coated abrasives will function under less-than-optimum operating conditions, as will other forms of abrasives, but the greatest economy in any method is obtained when all equipment is operating at maximum efficiency.

If belt life seems to be consistently shorter than expected, or if a belt shows a consistent pattern of undesirable wear, take a look at the equipment on which the belt is employed. This includes regular inspection of spindles, bearings, idlers, contact wheels, speed mechanisms, coolant systems, feed tables and the like.

Contact Wheel — The contact wheel plays a vital role in producing a desired finish and in extending abrasive belt life. To do this effectively it must be kept in good condition.

Use Storage Racks

Storage—When not in use contact wheels should be hung by their arbor holes on a wall or storage rack, so that there is no pressure on any side of the wheel.

In the case of rubber contact wheels, storing them in a standing position compresses the rubber, causing a "flat spot." On a lathe, turning at high speed, this flat spot has a bouncing effect on the work and will produce an uneven finish. In addition, the bouncing or chatter allows the work piece to return to the belt with a shock which may cause shelling of the abrasive mineral (especially if the contact wheel is a hard one).

Face Condition—A gouge in the face of a rubber contact wheel produces the same effect on a belt as does a flat spot, except that the uneven finish is localized on the work piece. The gouge will also produce an uneven wear pattern on the belt.

Edge Wear — In operations in

Table indicates where possible trouble areas on coated abrasive belt machine may occur and what to do to correct them

Equipment	Problem	Cause	Result	Solution
Contact Wheels (Rubber)	Out of balance or "flat spot"	Improper storage	Excessive belt wear; uneven finish; belt shelling	Store by hanging
	Gouged surface	Improper use	Wild scratches in finish; local unevenness in finish	Dress or recover wheel Proper care in belt tracking, proper storage
	Edge wear	Prolonged pressure on edge	Excessive belt wear	Dress Wheel Replace rubber facing
Contact Wheels (Cloth)	Out of balance Moisture	Improper storage	Uneven finish, excessive belt wear	Store by hanging
Lathe Spindles	Worn	Prolonged use with worn or out-of-round wheels	Causes contact wheel to chatter, producing uneven finish	Special bushings Shimming Replace spindle
	Bent	Being struck sharply; carelessness; excessive weight	Bounce and chatter on contact wheel	Replace spindle
Bearings	Worn Loose	Improper lubrication; dirty	Noise; vibration which lessens belt efficiency "Floating" Spindle	Clean or replace bearings
Coolant System	Dirty or exhausted	Improper maintenance, bad filter	Loss of belt efficiency due to improper lubrication; burning of workpiece	Clean and refill with new coolant
Dust Collector	Clogged	Dirty ducts	Fire hazard; poor working conditions; abrasive loading	Clean ducts and collector thoroughly and regularly
Idler Mechanism	Belt too loose or too tight	Poor positioning	Loss of belt efficiency; broken belt	Reposition with controls set in center of adjustable ranges
	Poor tracking	Vibration; dirty mechanism	Uneven belt wear, uneven finish	Tighten loose bolts, clean adjustment screw mechanisms
Speed Indicator	Inaccurate	Improper setting	Excessive belt wear; unsatisfactory finish	Check spindle rpm with tachometer and set speed indicator accordingly
	Loss of power	Worn drive mechanism	Same as above	Replace drive mechanism
Automatic Feed Tables	Sticky, uneven operation	Dirt in mechanism	Uneven grinding pressures, hence uneven finish; premature dulling of belt	Clean

which a great deal of pressure is applied at the edge of the belt, the contact wheel tends to wear, and eventually there will be no edge support for the belt. This promotes undue wear on the belt as it folds over the worn edge of the wheel.

The solution is to dress the contact wheel frequently enough to maintain a firm edge. In many cases, contact wheel rims can be refitted with new "tires."

Balance—Cloth contact wheels become unbalanced by absorbing moisture on one side or one edge as a result of improper storage. This can be minimized by keeping the wheels off floors or shelves, and hanging them with pegs through the arbor holes, as with rubber wheels.

Neither cloth nor rubber wheels should be left on a backstand overnight under belt tension, since the belt will compress one side of the static wheel. Static tension also tends to stretch the belt.

Care of Spindles

Spindles—Bent or worn lathe spindles also promote undue wear on the abrasive belt. A bent spindle will produce a chattering action not unlike that produced by an unbalanced contact wheel. Spindles are difficult to straighten; replacement is the sure way to eliminate this problem.

A worn spindle will vibrate the contact wheel and the belt, and will cause difficulties in belt tracking. The spindle can be shimmed with light metal or even cardboard for temporary correction.

As a more permanent repair, some plants make a bushing with an inside taper complimenting the worn spindle, and the contact wheel is refitted to the bushing. This particular problem is often encountered when a lathe is converted to a backstand operation.

Bearings—Ideally, a machine should be equipped with lifetime-lubricated, sealed bearings as a precaution agaist untimely wear. In the absence of these, a bearing with an oil reservoir is more effective on grinding machinery than is a grease fitting because the grease gun tends to push metal or dirt particles into the bearings along with the grease. If it is not feasible to use sealed or oil reservoir type bearings, the grease fitting should be covered with rubber cap to protect it from dirt.

A loose bearing will make a shaft or spindle run loose, with a floating or wobbling effect. This is transmitted to the contact wheel and the abrasive belt, and results in an uneven finish and undue wear on both the belt and the contact wheel. The loose bearing will also allow dirt to seep into the bearing race or housing, and will accentuate any unbalance in the contact wheel. A loose bearing and an out-of-balance contact wheel work against each other, and produce thoroughly unacceptable results.

When converting a lathe to a coated abrasive belt and backstand operation, the speed of the spindle is usually increased. This may result in a breakdown of slightly worn bearings, which functioned satisfactorily at the lower speed. The safe thing is to replace bearings when the conversion is made.

Coolant System—The coolant system performs a triple function: to cool the work at the point of contact with the abrasive belt, to wash away swarf and dirt which tend to clog or load the belt and to lubricate the cut.

From any standpoint, the coolant system should be cleaned frequently, even if it has a filter. A dirty filter passes a great deal of dirt. Regular maintenance includes draining, cleaning, and replacing the coolant with fresh material.

Cooling oils with anti-weld or other specific additives often use up these materials as part of the grinding function. When they are depleted, the coolant becomes ineffective. In aqueous solutions—water-base coolants—rust inhibitors also get "used up", and the possibility of the machine rusting is present unless the coolant is replaced or replenished regularly.

The circulating pump must be working efficiently to provide enough flow to remove the swarf in the proper manner, or the abrasive belt will reach a premature end point through loading, and it will be difficult to maintain a consistent finish.

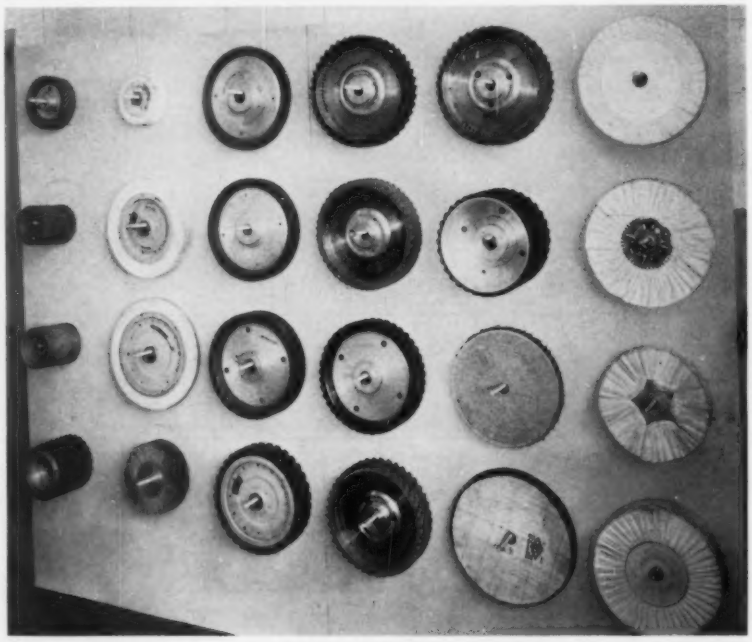
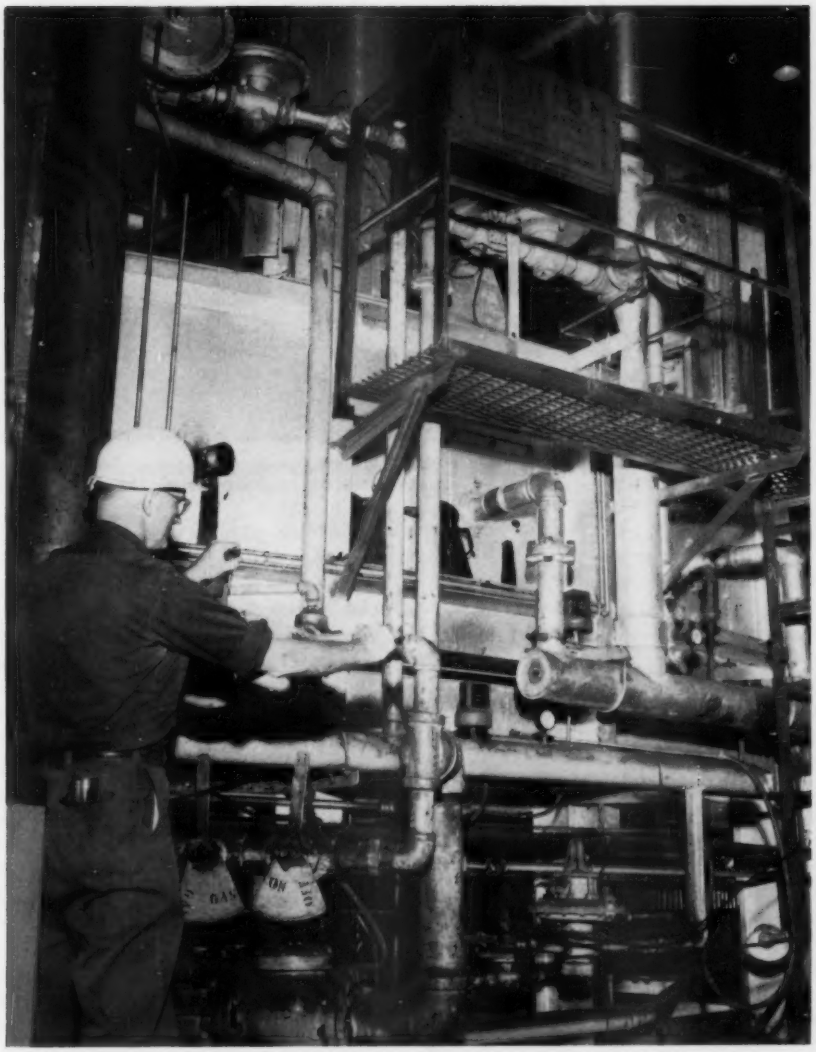


Fig. 2. Storage rack for rubber and cloth contact wheels keeps them off the floor. Hanging rubber wheels by their arbor holes keeps them from getting a "flat" side and protects cloth wheels from moisture and possible unbalance

Besides being important in maintaining safe working conditions for machine operators, a dust collection system has much to do with the quality of the finish and, again, the belt life.

Safety, for the plant as a whole and the individual operators, is a prime consideration. The dust collection must keep the air clean and pick up dirt particles as they are thrown off the work. When effi-

(Continued on page 230)



FM cocks on this heat treat furnace at a midwestern automobile plant insure against premature admission of gas to open burner cocks. In lighting off, gas flows through all cocks by way of side ports and operates the checking pressure switch. If even one cock is slightly opened, the switch cannot operate and the main gas valve cannot be operated

How To Prevent

"Lighting Off" Explosions in Furnaces

By J. B. SMITH, Chief Engineer, Factory Mutual Engineering Division

ONE RECENT study of 83 fuel explosions at heat-treat furnaces over a 10-year period showed that forty occurred during lighting-off. Of the forty, at least 25 were caused by one or more burner cocks being accidentally left open when the main gas valve was turned on. All of these accidents were preventable. The problem is, of course, the human factor. Industrial boiler and furnace operation, depending as it does upon human operators, will never be entirely foolproof.

This article will describe a gas safety control system developed by the Factory Mutual Engineering Division Laboratories of the Associated Factory Mutual Fire Insurance Companies. Currently in use in many Factory Mutual plants, it provides a simple, efficient safeguard against primary causes of explosions: premature admission of gas to open burner cocks.

The FM Cock Safety Control System — One type of the FM cock system is designed around three important units: a special gas cock, a checking pressure switch and an electric safety shut-off valve on the main gas line.

The FM cock is similar to normal gas cocks, except that it is equipped with two side outlets which furnish a small independent passageway that is open only after the main gas passage is completely closed. The cock is constructed as shown in Fig. 1, with a narrow keyway that permits either gas flow to

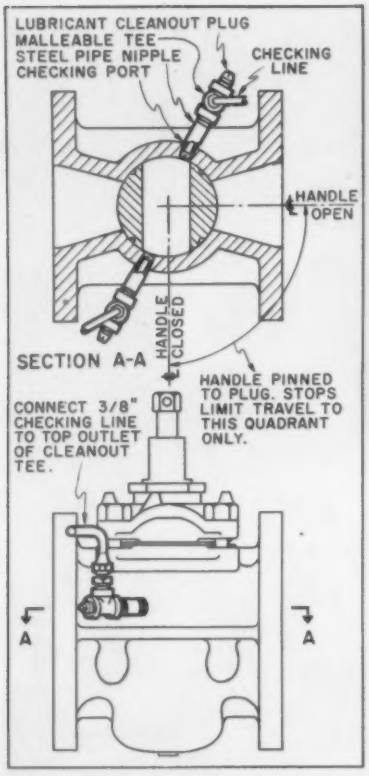
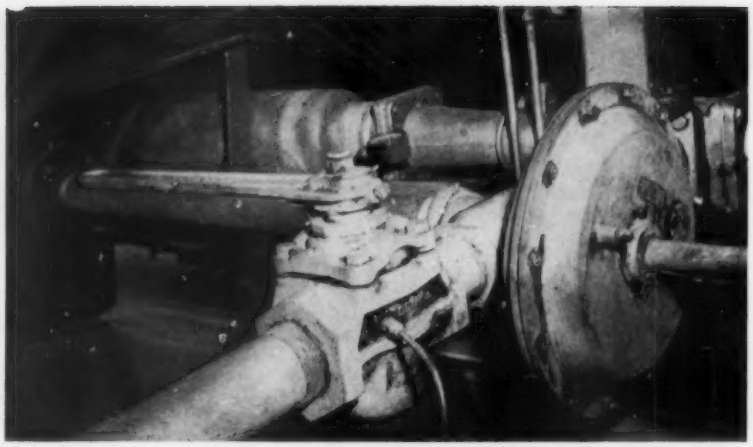


Fig. 1. Cock is constructed with narrow key-way that permits either gas flow to the burners or flow through the side outlets, but not through both

the burners or flow through the side outlets, but not both.

This construction feature is important. It is gas or compressed air supplied through the side ports of the cock, which furnishes pressure to energize the valve on the main gas line. This energizing force cannot reach the switch unless all burner cocks are turned off, owing to interior cock construction. It is therefore impossible to open the main gas valve unless the burner cocks are fully closed.

Cocks for this purpose are manufactured to particularly close specifications. In sizes up to 2 in., Factory Mutual approved cocks are manufactured by D. T. Williams Valve Co., Cincinnati, and W. J. Schoenberger Co., Cleveland. In sizes from 2½ in. to 6 in., the only Factory Mutual approved cock is the Nordstrom lubricated plug cock, manufactured by Rockwell Manufacturing Co., Pittsburgh. All cocks are suitable for manufactured, natural, propane and butane gases. The quarter-turn (90 deg) operation of the cocks provides a visual check on



FM cock used on furnace control system. Integral handle shows position of cock which should be fully closed. Gas flows through side ports to operate switch

cock position in addition to interior construction safeguards.

Cocks Connected in Series — The side ports of all cocks are connected in series with copper tubing. In a typical application where gas is used as the checking medium, one end of the line of tubing is connected to the main gas line on the upstream side of the main shut-off valve, the other to the checking pressure switch.

In lighting off, the operator first turns gas into the small tubing connecting the cock side ports. If the cocks are fully closed as they should be, gas flows through all cocks by way of the side ports and operates the checking pressure switch. This energizes the electric safety shut-off valve on the main gas line so that the operator can open it, which must be done by hand.

As soon as the electric valve is opened, gas flows into the burner piping and operates a low gas-pressure switch which "shunts out" the checking switch. This second switch keeps the electric valve from clos-

System Testing

The gas safety control system can easily be tested for proper operation while the oven is idle and the burner cocks are closed. The following procedure is suggested:

1. Observe that indicator on main safety shut-off valve reads "Shut."
2. Remove covers from pressure switches and note that all contacts are in the open position.
3. Close safety circuit switch.
4. Open cock and admit gas to the checking line. If air is used, start combustion air blower and open main blast gate.
5. Note that with all gas safety control cocks closed, checking pressure switch closes and light comes on.
6. Open and close any gas safety control cock and observe closing and opening of checking pressure switch.
7. Check for small flow from bleed orifice to make sure it is not obstructed.
8. Try to open manually the main gas safety shut-off valve. Only if all gas safety control cocks are closed, should it be possible to open this valve.
9. Note that contacts of low-gas-pressure switch close as the main gas safety shut-off valve is opened.
10. At the completion of the above tests, all gas cocks should be closed, covers replaced, and safety circuit switch left open. The combustion air blower, if any, should be shut down.

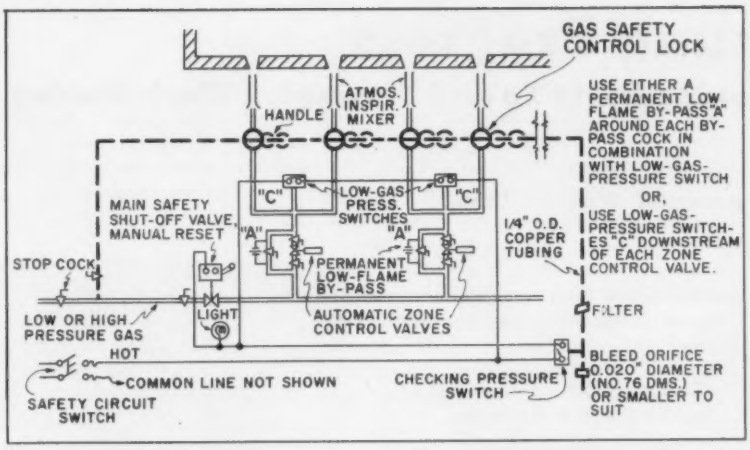

GAS SAFETY CONTROL LOCK
USE EITHER A PERMANENT LOW FLAME BY-PASS "A" AROUND EACH BY-PASS COCK IN COMBINATION WITH LOW-GAS-PRESSURE SWITCH
OR,
USE LOW-GAS-PRESSURE SWITCHES "C" DOWNSTREAM OF EACH ZONE CONTROL VALVE.
HANDLE
ATMOS. INSPIR. MIXER
"C"
LOW-GAS PRESS. SWITCHES
"A"
MAIN SAFETY SHUT-OFF VALVE, MANUAL RESET
STOP COCK
PERMANENT LOW-FLAME BY-PASS
1/4" O.D. COPPER TUBING
FILTER
LOW OR HIGH PRESSURE GAS
LIGHT
AUTOMATIC ZONE CONTROL VALVES
HOT
BLEED ORIFICE 0.020" DIAMETER (NO. 76 DMS.) OR SMALLER TO SUIT
COMMON LINE NOT SHOWN
CHECKING PRESSURE SWITCH
SAFETY CIRCUIT SWITCH

Fig. 2. In a combustion air blower system—found most frequently in industrial gas furnace systems—the checking pressure switch is operated by air pressure

ing when the individual cocks are opened to light the burners. It also furnishes the usual protection in case of gas pressure failure, being set to trip the main safety shut-off valve in the event of dangerously low gas pressure.

A bleed orifice is required at the end of the line of tubing. It must be small enough to prevent gas escaping into the room at dangerous rates, and to allow pressure to build up and close the checking pressure switch promptly if there is a free passageway through the checking tubing, yet large enough to quickly relieve pressure and re-open the checking switch to transfer supervision to low-gas-pressure switch.

Combustion Air Blower Application—In a combustion air blower system—the arrangement most frequently encountered in industrial plants—the checking pressure switch is operated by air pressure as shown in Fig. 2. A third pressure switch provides protection against failure of combustion air pressure, as well as assurance that the combustion air blower will be started in proper sequence when lighting-off.

The low-gas-pressure switch should be located in the burner gas piping so that there is no valve which can form a gas-tight barrier between it and the cocks. If such a valve is present, an additional pressure switch or a by-pass around the valve may be required.

Where automatic temperature control is by "high-low" or modulating zone control valves in the gas piping, Fig. 3, it is customary to provide a shut-off cock on each side of each control valve to permit its removal for repairs. A valved by-pass is also provided around each control valve to permit burner operation meanwhile. At such installations either a permanent flame by-pass is required around the valve in the by-pass line or an additional pressure switch downstream of the zone control valve. The contacts of these low-gas-pressure switches should be wired in series.

Occasionally on new multi-burner equipment, and more frequently on older furnaces and ovens, the temperature is automatically maintained by zone control valves firing "on-off" with a continuous pilot at each burner. When such equipment is shut down, pressure trapped between the closed main safety shut-off valve and closed zone control valves would hold the low-gas-pressure switch closed, keeping the main safety shut-off valve energized so that it could be re-opened even though all burner cocks were not closed.

This by-passing of the safety checking system can be prevented by arranging a small solenoid valve to automatically open and bleed pressure from the piping when the main safety shut-off valve is closed. The small solenoid valve is wired to special contacts in the main safety shut-off valve which hold the solenoid valve closed while the shut-off valve is open.

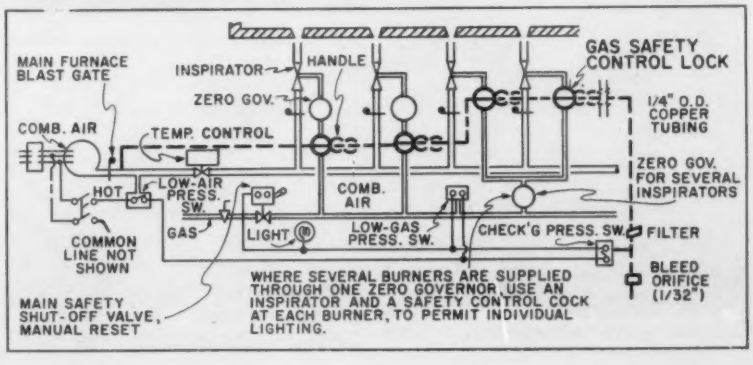
If for production reasons the firing of burners cannot be interrupted to shut the oven down for several minutes to make the foregoing tests, the checking pressure switch contacts should at least be inspected to see that they are "open," and the bleed-orifice should be examined externally for obstructions.

The inspector should check the covers of safety control devices (safety shut-off valves, pressure switches, etc.) to make sure they are securely held in place by the screws provided. The presence of valves or similar devices, with covers removed or loosely attached with only a screw or two, indicates the possibility of habitual tampering for the purpose of by-passing the safety control arrangement. Where means are furnished, covers of safety shut-off valves should be sealed in place with wire and lead seals, and the condition of the seals checked regularly.

Provision for Individual Burner Cocks—Individual burner cocks should be provided where practical, so that gas can be supplied to the furnace burners one at a time. If the valve arrangement is such that two or more burners must be

(Continued on page 227)

Fig. 3. Where temperature regulation is attained by "high-low" or modulating zone control valves a shut-off cock is usually provided on each side of control to permit removal for repairs. Valved by-passes permit burner operation to continue



Work-Positioning Progress

Current Methods of Moving Parts To and Through a Work Station

By A. T. GAUDREAU, Gaud-Reau Associates, Westport, Conn.

HANDLING assembly component parts, one at a time at a fabricating machine, usually marks the last handling stage before reaching automatic processing. The steady development of automatic and semi-automatic machinery since the early 1930's has greatly mechanized the manual handling of the work into and out of the machines. This upgrading step induced the replacement of skilled machinists by unskilled operators. It reduced or eliminated the work-positioning done by hand at the machine, but it did not improve the handling of the work from one machine to the next. The inter-machine mechanization of material movement, however, was not developed until automatic handling at the machine itself had been attained.

Table I. Fixtures and attachments for feeding, holding, cycling, transferring

- **A. Automatic work feeds**
  - Drill-press feeds, automatic
  - Punch-press feeds, automatic
  - Hopper feeders and escapements
  - Screw feeders, automatic
- **B. Magnetic holding devices**
  - Rotary chucks, magnetic
  - Swivel-type chucks, magnetic
  - Sine-angle tables, magnetic
  - Sheet supports, magnetic
  - V-blocks, magnetic
  - Base holders, magnetic
- **C. Mechanical holding fixtures**
  - Clamping devices (air, hydraulic and magnetic)
  - Coil holders and take-ups
- **D. Work-indexing devices**
  - Rotary index machines
  - Rotary index tables
  - Rotary work tables
  - Trunnion index machines
- **E. Small-tool attachments**
  - Air motors
  - Drilling heads, self-contained
  - Drilling heads, multiple-spindle
  - Powered screwdrivers and nut runners
  - Tapping heads, air controlled
  - Tapping heads, self-contained
- **F. Automatic cycling controls**
  - Limit switches to control manual switches and push buttons
  - Mill-table controls
  - Air cylinders to replace arbor presses
  - Semi-automatic inspection gages
  - Control gages for cylindrical grinders
- **G. Work-transfer devices**
  - Built-in transfer conveyors
  - In-line assembly machines
  - In-line transfer machines
  - Automatic ejecting devices

1. Mechanization of material handling at the machines

Machine operations which were once separated are now combined within single machines or connected machines to eliminate needless manual handling as shown in Fig. 1. To attain this objective, an increasing number of material-handling devices have been built into the machines themselves, such as in metal-cutting machine tools. The trend in mechanization preceding continuous processing was inevitably towards machine operations proper such as feeding, holding, indexing, cycling, and transferring material at the machine on an automatic basis. Representative fixtures and attachments designed for the performance of these functions are listed in Table I.

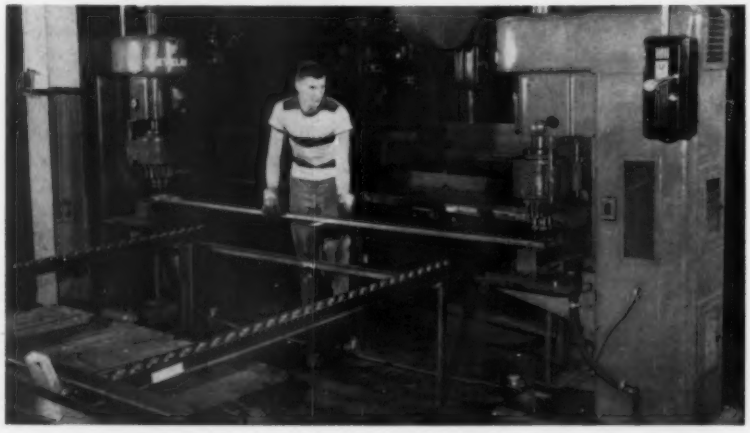


Fig. 1. Simultaneous operations performed by two machines on same work piece

2. Feeding small parts to individual work stations

The small handling operations at the machine are greatly reduced by the use of automatic feeders of bulk materials and small parts. These devices are readily mounted on individual machines and provide automatic parts positioning through controlled feeding. Among the more common types of machine-mounted devices for feeding small parts are the following:

Self-stacking bins, tilted tote pans, ready-count containers, compartmented bins, drop-bottom skid boxes, structural hoppers, rotary hoppers, automatic hopper feeders, vibratory bowl feeders, drop-discharge chutes, gravity slides, vibrating troughs.

The use of portable containers for delivering small parts to an individual work station also provides the means for supplying the manual feeding of these parts into the processing or assembly operation. Some of these containers have been designed to facilitate and reduce the work of supplying small parts to the work place, and of feeding them into a process operation as components.

An example of self-stacking bins designed for work simplification in the manual handling of small parts is given in Fig. 2. Materials received in the stockroom at a Zenith Radio Corp. plant are first identified, counted, and then transferred into self-stacking bins which are stored in specially-designed racks. When bins are delivered to production or

assembly departments, they are stacked uniformly at work stations, and empty bins returned to the stockroom. Formerly, materials received in cartons, kegs, and boxes, all of many container sizes, were delivered to stockrooms and then to production departments in the same containers. Work stations were con-

Fig. 2. Self-stacking racks store parts for simplified counting, storing and use

gested with unsuitable containers and debris. Parts were often mixed by stacking one box inside of another, and counts were inaccurate. The self-stacking bins reduced handling to a minimum, improved housekeeping, and completely eliminated mixed parts and inaccurate counts.

Compartmented bins designed to simplify the assembly of small parts at a work bench are illustrated in Fig. 4. Arranged in semi-circular order, and in two integrated arcs at each station, these bin sections place from 15 to 25 different component parts at the fingertips of each operator.

At work stations where the quantities of parts used are comparatively large in volume but low in diversification, structural hoppers are sometimes mounted directly on the machine. These hoppers are filled mechanically, by pouring kegs or drums of these parts, using a revolving barrel grab attachment mounted on a powered high-lift industrial truck.

3. Transferring materials within the work station

To speed the transfer time in changing over from one part to another at a metal-cutting machine, a number of holding devices have been developed. See section B of Table I.

The work transferring device providing much facility at comparatively low cost is the rotary index table. It may be as simple as a dial which is actuated by an air cylinder, or it may be a more elaborate device in the form of a cam-indexed mechanism operating with fine precision.

A multi-station rotary indexing machine automatically fed by inter-machine conveyor is shown in Fig. 3. It is a semi-automatic work-positioning unit used in forming and glazing porcelain insulators. The index head is equipped with five radiating arms for transferring the work around this work station. The rotary head automatically picks up one insulator at a time from the conveyor at the operator's right. The part is raised, indexed counter-clockwise, and dipped into the glaze pot shown. The part is indexed again and spun for air-drying. It is finally indexed to the operator, who examines it and places it in a rack for more air drying. The rack is later placed on a kiln car for transportation to the kiln area.

Small-tool attachments as listed in section "E" of Table I likewise greatly reduce the work-positioning effort and time at a work station. Also, at work stations where no machinery is involved, such as at the assembly bench shown in Fig. 4, material handling time can be greatly reduced. This picture shows suspended screwdrivers, semi-circular compartmented trays for supplying small component parts, inclined cartons supplying larger parts, and portable gravity roller conveyors carrying the finished assemblies away. These work-station facilities reduce material handling to a mini-

Fig. 3. Multi-station rotary indexing machine is automatically fed by conveyor

Fig. 4. Motion-economy pans at this work station speed small-parts assembly

Fig. 5. Parts-leveling truck-tables keep parts at working height, close to operator

mum for these operators and permit them to perform their assembly operations with virtually no interruptions.

4. Upgrading automatic machinery into automation

Thus, through the integration of relatively inexpensive, built-in, material handling aids, almost any manufacturing or assembly operation can be upgraded to virtually eliminate material handling effort at the work station. This mechanization development applies equally to broaching, sawing and grinding, as well as to milling, drilling and turning on metal-cutting machines.

This attempt to remove the manual function of material handling at the machine, has received the name "automation." In effect, automation is but the application of mechanical handling principles at the machine proper to permit the *continuous* automatic loading and unloading of work in process. It may also include the automatic removal of scrap in metalworking industries. Although production had already been made automatic on automatic machinery, it was not yet on a continuous-flow basis prior to the advent of automation, and it still had to be moved in batches.

The subsequent addition of transfer equipment to standard machines opened the way for the uninterrupted flow of work between automatic machines. The integration of mechanized handling at the machine with mechanized transfer between

Fig. 6. Portable mechanical load stacker

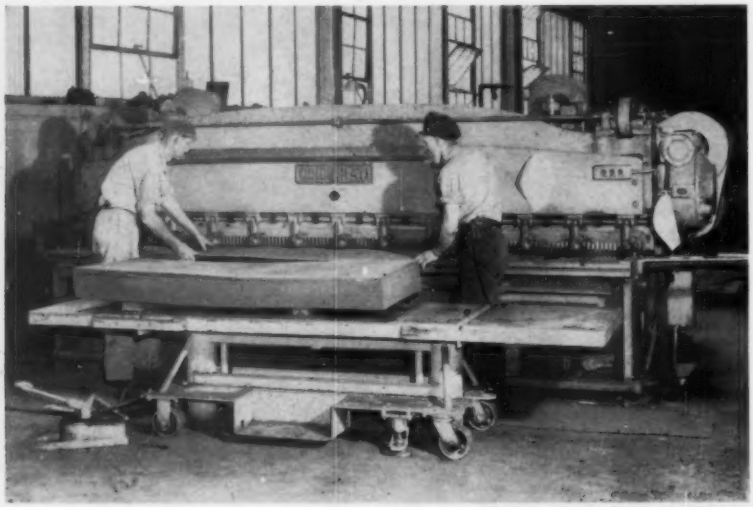


Fig. 7. Sheet-feeding table can be elevated to height most suitable for shear

Table II. Work-positioning equipment, as it fits several basic application categories

Basic Types of Work-positioning Equipment	Functional Applications: Elevating and Transferring Materials at Bench Level	Leveling and Feeding Sheets at Working Height	Vertical Positioning and Turning of Heavy Items
Portable hydraulic elevating tables			
1. General-purpose tables	X	X	X
2. Die-handling tables			X
3. Sheet-feeding tables	X	X	
4. Parts-leveling truck-tables	X		
Fixed-level feeders and tilters			
5. Ball transfer tables		X	
6. Stationary tilters and upenders		X	X
7. Portable mechanical stackers	X	X	
Floor-mounted stationary lifts			
8. Working-height platform lifters		X	X
9. Rotating work-height positioners			X
10. Tilting welding positioners			X
General-type material handling equipment			
11. Cranes and hoists			X
12. Mobile stackers	X	X	X
13. Industrial trucks			X
14. Work-station conveyors	X		X

machines into a continuous flow gave rise to continuous automatic production. This latest development is but another step in the upgrading of existing automatic manufacturing. The fully automatic machines are integrated with automatic interconnecting transfer devices to perform a continuous series of operations on a single product. The machines are then grouped into automatic systems or production lines.

5. Varieties and applications of work-positioning equipment

The handling of materials at a fabricating machine or assembly station usually goes through the following three fundamental stages:

1. Positioning the work
2. Processing the work
3. Removing the work

As in most aspects of material handling methods, a wide diversification of devices is available to facilitate the work of feeding, positioning and transferring material within a work station. These devices are supplementary to the handling attachments frequently built into or mounted on the processing machines themselves. Although there are certain types of separate handling equipment commonly used for positioning work, many general types used for transportation and stacking are likewise used for work-positioning as needed.

Among the types of separate handling equipment designed specifically for work-positioning are the following three categories:

a. Portable hydraulic elevating tables; b. Fixed-level feeders and tilters; c. Floor-mounted stationary lifts.

To this list must be added a fourth category of separate handling equipment also used for work-positioning, although not designed specifically for that purpose:

d. General-type material handling equipment.

These four main categories of work-positioning equipment are broken down into 14 representative basic types in Table II. These 14 types are further classified functionally over the following three major applications at work stations:

Fig. 9. Stationary air lift in conveyor

1. Elevating and transferring materials at bench level; 2. Leveling and feeding sheets at working height; 3. Vertical positioning and turning of heavy items.

All of these three functional applications use six or more different basic types of work-positioning equipment, and many of the equipment types serve more than one functional application. A review will now be made of the various basic types of equipment best suited for each of these three major functional applications.

6. Elevating and transferring materials at bench level

Among the original devices designed specifically for positioning materials at work stations are general-purpose hydraulic elevating tables. Most designs are controlled by a foot pedal, and lifting capacities are ordinarily limited to 2,000 lb;

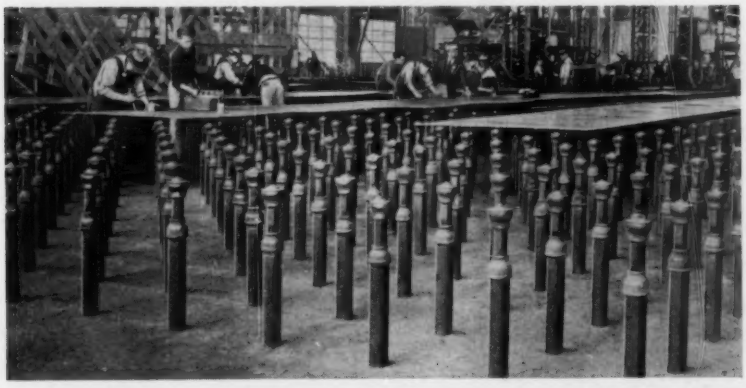


Fig. 8. Ball transfer "table" to move large plates consists of pipe-mounted balls

Fig. 10. Hand truck positions heavy dies

the table top can be raised to working level, and the entire unit wheeled freely on the floor like mobile equipment. Some table tops can be rotated 360 degrees.

These tables are often used for handling sheets, dies, bar stock, and welding work. They are also used in maintenance work for mounting heavy parts on machines not serviced by adjacent crane and hoist facilities.

A great number of special adaptations of these tables have been designed for specific purposes such as for servicing heat-treating furnaces and paint-drying ovens.

Of particular application, in positioning and supplying trays of lightweight component parts at workbench level, are parts-leveling tables such as illustrated in Fig. 5. In this unit, the spring-supported mobile bottom automatically rises as the top tray is emptied. One of these trucktables is usually placed on each side of the operator. In this arrangement, as one truck is emptied the other is filled with completed parts, both table tops keeping the parts at constant work level.

Another basic type of portable elevating device used at work stations is the portable mechanical stacker as represented in Fig. 6. Designed primarily for transporting, high-lifting and tiering or racking skid loads, heavy dies, and other heavy objects in storage operations, it is also used intermittently at work stations. In this capacity, it can transport work to a machine, position it on the machine, and later remove the processed work and transport it to the next work station.

At the work station, portable stackers are primarily used for height positioning and placement of work, and dumping of loose materials into feed hopper at machine. They are sometimes used as work holders at the machines and thus function as work-leveling tables. The hoisting mechanism is either mechanical or powered, and most of the stackers used at work stations are pushed around by manual effort because of the short distances they usually cover.

Work stations are frequently equipped with floor-mounted conveyors, for receiving, storing, transferring and dispatching work in process. The work station functions as a way-station intercepting material from an inter-station flow. Other conveying devices frequently installed within the work station proper, to facilitate work feeding and positioning, include overhead monorails and traveling hoists.

7. Leveling and feeding sheets at working height

Elevating sheet-feeding tables installed at a machine keep a pile or bundle of sheet stock at feed-line height, and within horizontal transfer reach of the operator at all times. Widely used in press and shear work, these tables are of heavier construction than the general-purpose elevating tables already described. Sheet-feeding tables have capacities ranging up to 30,000 lb. As a rule, the tops of these tables do not revolve. Some of them can be tilted for use with inclinable presses. As the load is fed from these devices, the table top is raised so that no lifting or other manual handling operations are required to keep the material at work level as shown in Fig. 7. Heavy or overbalanced pieces are held, without clamping or built-up supports, at the correct height for machining operations.

For feeding heavy flat stock, such as metal plates, in a fixed horizontal plane, a work-station device operating on a series of projecting rotating balls is often used. It is called a ball-transfer, and is made up in two types, namely:

a. Table-type

b. Pipe-mounted (Fig. 8)

Working-height platform lifters at work stations are often used as bench positioners for processing and assembly operations. A stationary air-lift used for positioning heavy sub-assemblies at baking ovens is illustrated in Fig. 9. Some of these lifts permit rotating the work 360 degrees on a horizontal plane.

Welding positioners, for both large and small work shapes, are among the oldest types of positioning equipment in the form of stationary lifts.

Positioners also are used to raise heavy materials to proper working height, and to keep the work at the most convenient positions for the welder.

The use of mobile stackers in the form of powered fork-lift trucks in small metal-working plants frequently serves the function of working-height platform lifters for sheet stock. In this application, the truck

Fig. 11 Fork-lift truck serves as work positioner by supplying bags to operator

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delivers a bundle of sheets on the top of a floor-mounted feeding rack in the work station, and the sheets are fed directly into a shear or punch press from the elevated bundle.

8. Vertical positioning and turning of heavy items

For the handling of dies and other heavy objects at a machine, a number of widely different devices have been especially designed. Portable die-handling tables are a special adaptation of elevating tables already described. One type of table has been designed in the form of a hydraulic truck which permits 16,000-lb dies to be transported between presses and storage racks, in addition to their being positioned in and out of these two housings.

Lighter-weight dies up to 500 lb can readily be transported and positioned by portable mechanical stackers, such as illustrated in Fig. 6. Dies weighing up to 7,500 lb are frequently handled on powered walkie trucks as shown in Fig. 10. The platform of this truck is equipped with pushing plate for pushing and pulling the die completely off and back onto the truck platform.

In addition to their application as mobile stackers for positioning dies, powered industrial trucks are used extensively in positioning materials of innumerable types at work stations. See Fig. 11 on the preceding page.

To make industrial trucks handy for positioning work when needed for this purpose, a number of attachments have been especially designed. Among these are revolving grabs, cranes, upenders and pusher devices for dumping, pushing, positioning and holding material at work stations. A work-positioning manipulator attachment on a lift truck is shown in Fig. 12 in the process of rotating a heavy ingot in a forge.

Other rotating work-height devices have been designed in the form of welding positioners which are usually floor-mounted at work stations. They are used for raising, revolving, and tilting heavy welding work, and to hold it in the most convenient position for the welder. Stationary tilters and upenders are frequently used for sliding work from

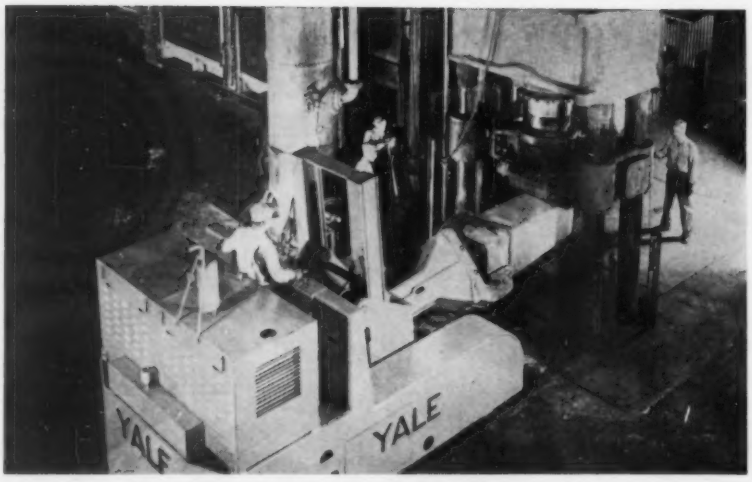

Fig. 12. Manipulator attachment on lift truck positions ingot in forging hammer

punch presses to roller conveyors, and for tilting up welding work on conveyor runs in mass-production lines. These tilting devices are usually operated by air-cylinders and the air cylinder is controlled by a foot valve.

In the basic-type category of cranes and hoists designed for work-positioning, the jib crane is generally considered the leading device. It is equipped with a horizontal boom which can be revolved around a fixed supporting upright which may be a mast, column or hinged bracket. Traveling along the swinging boom is a manually-operated or motor-driven hoist used for raising, swinging, and positioned heavy work parts into machines or up to working level in assembly stations. A rotating jib crane serving nine work stations spotted around a circular area is illustrated in Fig. 13.

For lifting and positioning machine dies, many machines are now equipped with built-in jib cranes. Although jib cranes are usually considered the most common unit in the crane category designed especially for positioning objects at work stations, bridge cranes may also be converted to this function. These cranes can also lift, transport and spot loads as needed, so long as these loads are located within the area enclosed by the runways. **End**

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Fig. 13. Rotating jib crane provides hoisting capacity to nine work stations

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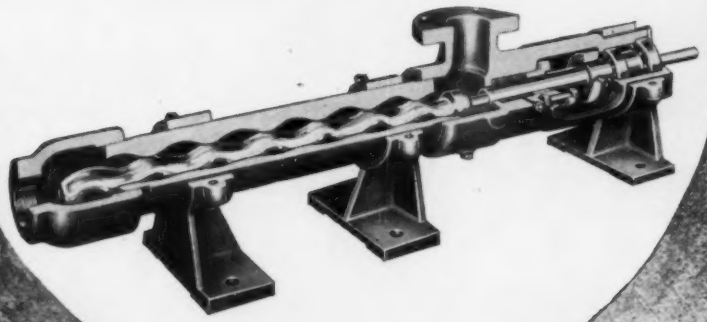

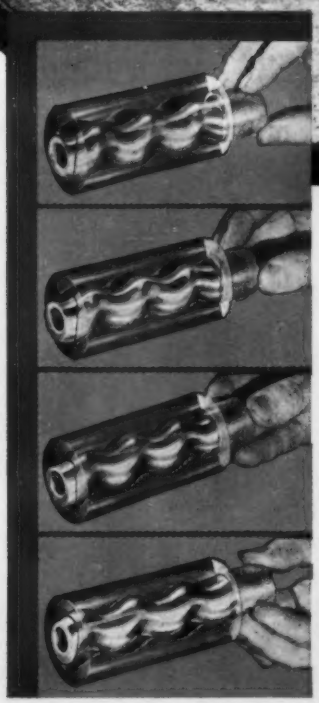

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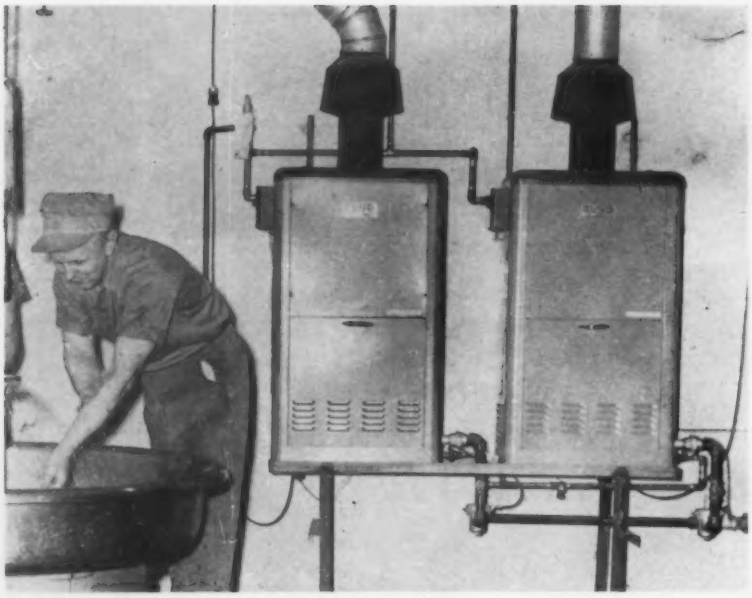


Two of nine automatic gas water heaters installed at point-of-use at Yale & Towne's, Stamford, Conn., plant. Thirteen washfountains, three showers and 10 wash basins are supplied by heaters

How 'Spot' Hot Water Cuts Costs Here

WHEN YOU SELL a plant and then lease back a portion that has no water heating facilities you have created a few plant engineering problems. That's what happened to Yale and Towne Manufacturing Company in Stamford, Conn. Providing hot water for showers, lavatories, sinks and washfountains was just part of the problem. They also needed process steam.

To meet its hot water problem for 400 employes at the end of each eight-hour shift, the decision was made to install nine automatic gas water heaters directly at their point of use. Small steam boilers were installed centrally in buildings requiring steam for processing. Steam heat is purchased.

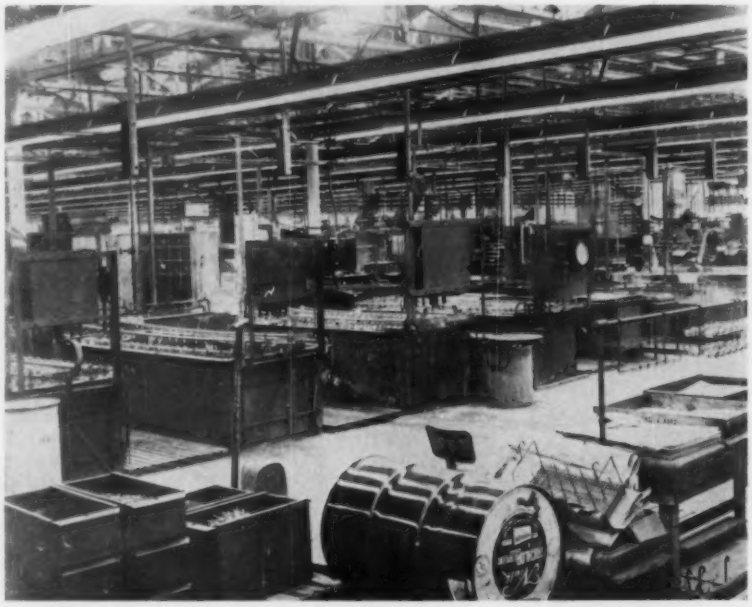
Installation of a central steam plant for all three jobs would have resulted in: 1. Large boilers. 2. A complete new steam piping program throughout part of the plant which occupies three city blocks. 3. Heat losses in long steam lines.

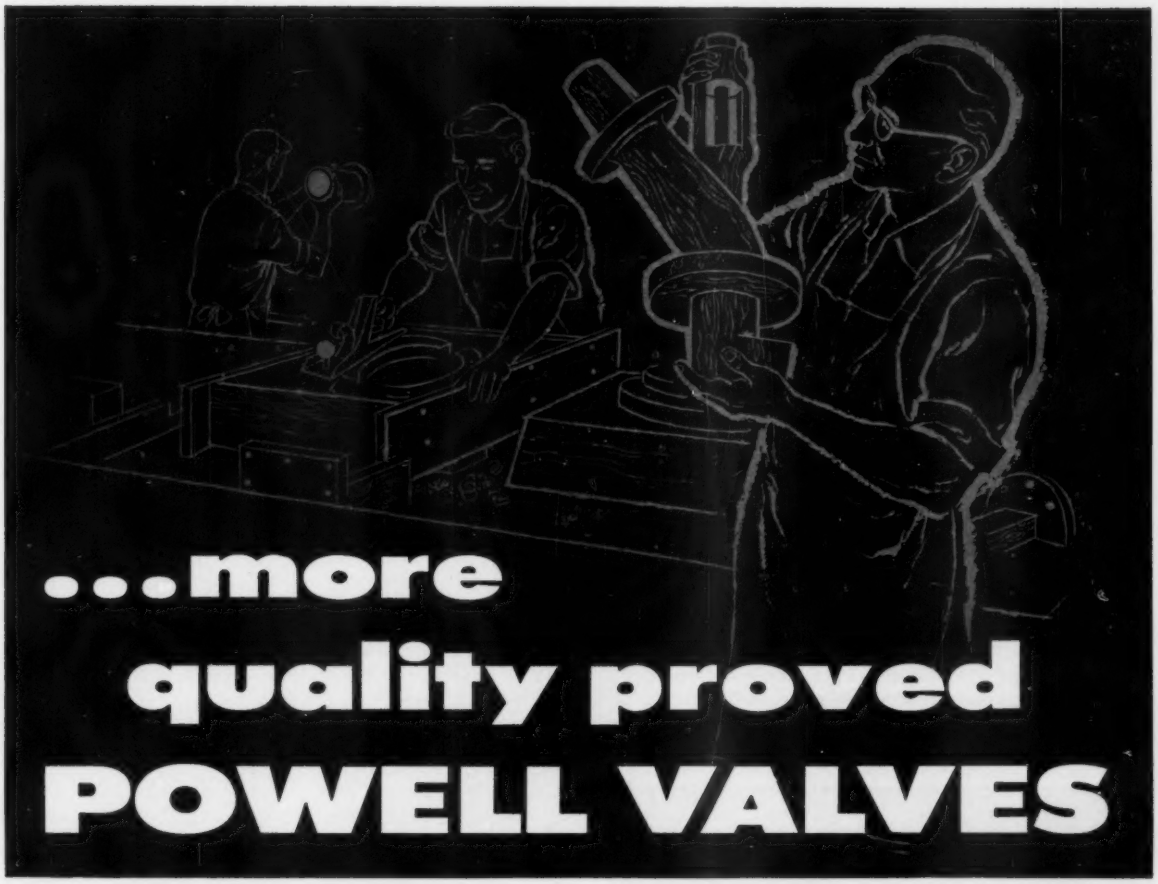
The small continuous flow units provide ample hot water for three separate half-hour periods of peak need at the end of each shift. This type of installation was made rather than maintain a large storage of hot water 24 hours a day for processes.

Three small steam boilers—two of which are rated at 100 hp and the other at 50 hp—were installed in the buildings where steam was required for plating, degreasing and 23 other processing needs.

Eight automatic gas water heaters were employed in six Yale and Towne buildings to supply hot water for 13 Bradley 54-in. washfountains. Two of these continuous flow type units, made by Ruud Manufacturing Company, Kalamazoo, Mich., also furnish hot water for three showers and 10 wash basins. **End**

This is one of the areas in which small steam boilers supply process steam





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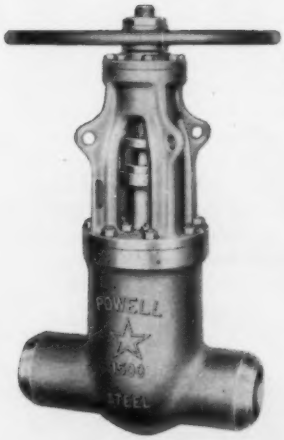


Fig. 11303—1500-Pound Cast Steel Pressure Seal Gate Valve.

Fig. 375—Bronze Gate Valve for 200 Pounds W.S.P. Union Bonnet. Inside Screw Rising Stem.

Fig. 11365—Steel Pressure Seal Horizontal Lift Check Valve for 1500 Pounds W.S.P.

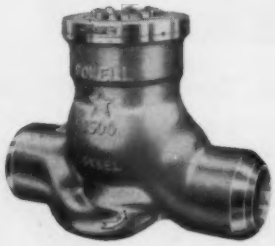
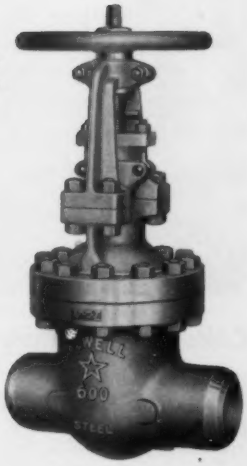


Fig. 6003-WE—Steel Gate Valve for 600 Pounds. Welding Ends. Outside Screw Rising Stem and Yoke.



for quality-crafted flow control

Ask your Powell Valve Distributor for the facts about quality-proved bronze, iron, steel and corrosion-resistant valves. Whatever your flow control problem, there's a Powell Valve to solve it.

THE WM. POWELL COMPANY, CINCINNATI 22, OHIO . . . 111th YEAR

For more facts circle 569 on Reply Card

Huge Precast Wall Bows, But Does Not Break, As It Is Tilted into Place

BELIEVED TO BE the largest single wall section ever lifted into place by crane, this 40 ft by 24 ft section was raised recently at the Colson Corporation's new caster plant in Jonesboro, Arkansas. A 25-ton crane was augmented with a 15-ton crawler crane to lift the six-inch-thick wall.

This section as well as the other walls of the 89,000 sq ft plant were poured into frames placed directly on top of the concrete floor slab and set in position to be tilted exactly into place.

According to McDaniels Brothers Construction Company, the contractor, lifting the giant wall by crane was a gamble because it was not known if it would break under its size and weight of 72,000 lb. Although the wall bowed almost 12 in. no breaking or cracking occurred.

Specially Built System Assures Automatic Lubrication of High Speed Steel Rolling Mill

TREMENDOUS PRESSURES and resultant heat generation on gears and drives of a high speed steel rolling mill demand continuous flow of proper lubricants.

To meet this demand, three specially-built mill lubrication systems feed approximately 475 gpm of extreme pressure oil of various viscosities to gears and bearings on drives of a new merchant bar and rod mill of the Atlantic Steel Company at Atlanta.

Recently placed in operation, the $9 million mill is rated as one of the fastest combination units in the world. It is capable of producing three strands of rods simultaneously at a delivery speed of 500 fpm, and can produce merchant bar in a wide range of sizes and shapes at rates from 30 to 80 tons per hour.

A feature of the mill is the regulation of all lubrication by 327 built-in orifices which assure distribution of lubricant in proper quantities to the numerous points of use and also eliminates the need for external sight feeds. Of this total, 258 orifices supply oil to individual bearings and 69 supply sprays at gear mesh points.

The lubrication systems, including design of cellar and piping layouts, were supplied by Dravo Corporation.

The smaller of the three mill lubrication systems supplies 22 gal per minute of 1,000 SSU oil at 100 F to gear drives which operate the billet cross pushers for the gas fired reheating furnace.

Two larger lubrication systems supply oil to the main gear drives, pinions, and auxiliary equipment.

Tied into the two larger systems serving the mill are 14 pressure reducing stations to regulate oil pressure to the various orifices. Pressure switches at each pressure reducing station control signal lights and a warning horn on a large signal panel above the mill floor located directly opposite the main mill pulpit. A siren and lights on the signal panel serve as alarms on the main system pressures and reservoir oil levels.

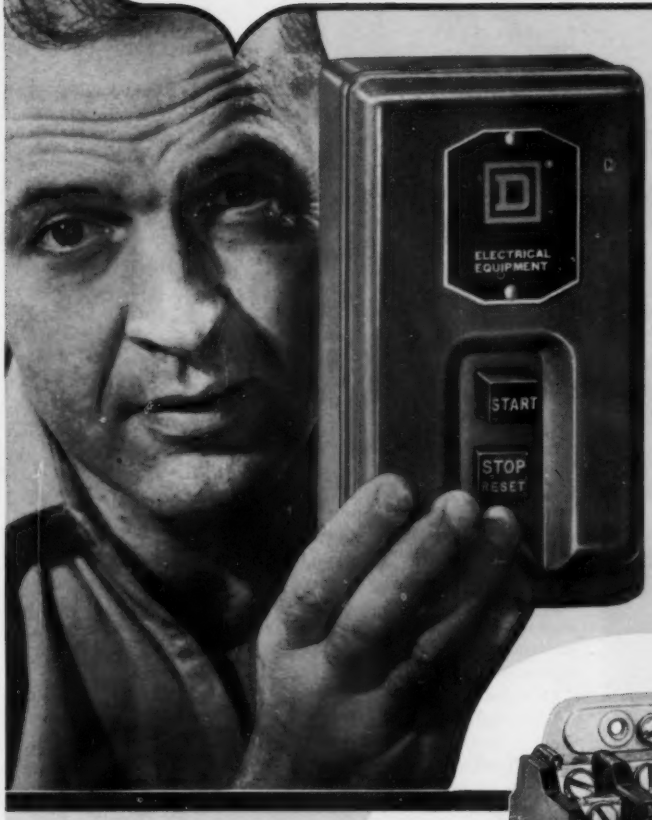
College Laboratory Uses "Do-It-Yourself" Air Liquefier

RESEARCH PROGRAMS at Amherst College in Massachusetts require a constant and reliable supply of liquid air for low temperature work, mass spectrometer and cryostat operations, as well as for cold traps, as a precooler for a helium liquefier and as a refrigerant for liquid helium storage.

In December, 1955, a Norelco Gas Liquefier went into service at the College, one of the first installations of its kind in the country. In the following 17 months, the unit was operated 1270 hours—an average of about 17 hours each week. It produces approximately 5 quarts of liquid air per hour, which is discharged into 25-liter containers.

The installation is credited with saving the College about $3500.00 during the time it has been in use. The liquefier, being on the site, has appreciably reduced evaporation losses and has completely eliminated delivery delays.

This NEW Manual Starter has EVERYTHING!



NEMA Sizes 0 and 1

Two, three and four-pole construction

- ***SMALLER!*** Takes less space, whether it's built into machine or mounted externally
- ***SMART STYLING!*** Matches the streamlined appearance of today's modern machines
- ***QWIK-MAKE, QWIK-BREAK!*** Positive snap-action opening and closing of contacts. Longer contact life
- ***TRIP-FREE OVERLOAD PROTECTION!*** Impossible for operator to hold motor circuit closed against overload
- ***LONGER LIFE!*** *Toggle Action* operating mechanism. Heavy-duty construction throughout
- ***EASIER INSTALLATION!*** Wire it without removing starter from enclosure. All terminals have pressure wire connectors

- ***EASIER MAINTENANCE!*** "Off-the-Shelf" parts kits make normal maintenance and modifications easier than ever. They're easy to buy, easy to identify, and faster to install
- ***TAMPER-PROOF!*** Cover padlocking device prevents tampering by unauthorized personnel. Safety latch locks "start" button in "OFF" position
- ***VISIBLE INDICATION OF OVERLOAD!*** Self-centering push-buttons show when overload has occurred

CHOICE OF ENCLOSURES:

- Water and Dust-Tight
- Hazardous Locations
- Flush Mounting

Write **for BULLETIN 2510 B-C**
Address Square D Company, 4041 North Richards Street, Milwaukee 12, Wisconsin

EC&M HEAVY INDUSTRY ELECTRICAL EQUIPMENT...NOW A PART OF THE SQUARE D LINE

SQUARE D COMPANY

For more facts circle 570 on Reply Card

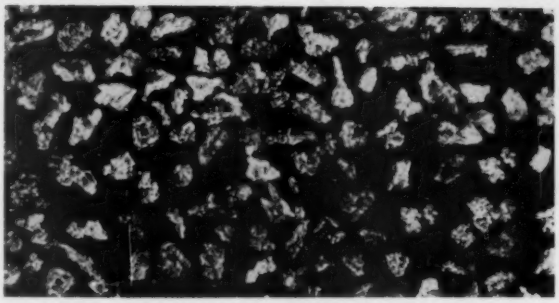
Man-Made Diamonds a Reality—Not Pretty, But They Work Hard

INDUSTRIAL DIAMONDS, man-made but equal in performance to those made by nature, can be produced in substantial quantities, according to the Metallurgical Products Department of General Electric Company. More than 100,000 carats of the diamonds already have been produced in their pilot-plant operations in Detroit.

These operations have proved that commercial production of man-made diamonds is commercially feasible, and GE is planning to expand their production in 1958.

Current price of the ungraded diamonds is slightly above the cost of ungraded natural diamonds. They are outside the realm of "gems" or decorative jewelry, since they are for grinding wheels, lapping compounds and other industrial applications. In size, they range from the size of a fine grain of sand to that of a coarse grain.

The diamonds will be competing with fragmented bort (made by crushing material that is imperfect for use as single stones) from natural diamond sources. The United States will import an estimated seven million carats of bort this year, for industrial use, and successful commercial production of the man-made diamonds will provide an adequate supply of this vital material without importing.



Big Forging Press Adds Capacity, Flexibility to Dunkirk Plant

A new 2000-ton hydraulic forging press for hot working of steel, titanium and other metals has been placed in operation at Allegheny Ludlum Steel Corp.

The new press substantially increases the forging capacity of the Dunkirk Works, which is a producer of tool and die steels, stainless steel wire and other steel products, as well as increasing the maximum size of forgings made by Allegheny Ludlum. It can forge steel shapes up to 80 in. in width, weighing as much as 28,000 lb, in a wide variety of shapes including large size blocks, discs, sleeves, rings, round bars, flats and billets.

Of an unusual design and believed to be the first of its type built in this country, the press and its auxiliary equipment are housed in a stainless steel-clad building containing about 50,000 sq ft of floor space. The press incorporates automatic control features and auxiliary equipment designed for fast, economical hot forming.

A substantial portion of the time on the new press will be devoted to forging extra large sizes of tool and die steels. It is one of the largest presses in the industry to be used in forging these products.

The new forging press was built by Lake Erie Engineering Corp., to specifications worked out in cooperation with the engineering department at Allegheny Ludlum.

Moving the Work to the Rivet Gives Better Results More Efficiently

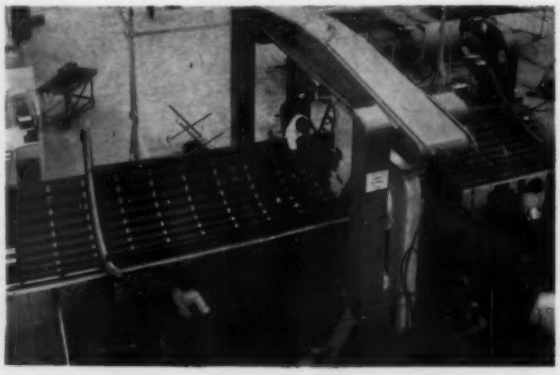
FOR QUICKER and more efficient riveting to the close tolerances specified for the Douglas DC-8 jetliner, a new gantry type fastening machine has been developed by Douglas engineers. Principal feature of the machine is that it brings the riveting operation to the work rather than moving the work to a stationary riveting location.

In operation, a wing or fuselage panel on a simple platform is placed between the rails of the gantry, and the riveting yoke is moved down one side of the panel, upsetting and shaving each rivet. At the end of the panel the yoke is reversed and the opposite side of the panel is completed. The panel itself is not moved until the job is completed.

The riveter is essentially a large mobile machine on which a yoke containing the riveting equipment freewheels over the panel. It is triggered into approximate working position by air motors controlled by the operator.

An automatic cycle starts with the bottom cylinder containing a pressure foot rising to the work. This exerts a clamp force to squeeze the panel upward against the head of the rivet. Rising within the lower cylinder, a rivet gun upsets the rivet against an anvil and retracts. Its place is taken by a shaving mechanism that removes excess rivet metal to close tolerance. After the shaver retracts, the yoke is hand-positioned to the next rivet location and the cycle is repeated.

This system of riveting was conceived by T. S. Crispin, Tooling Administrator of the Santa Monica division. The machines are manufactured under license by Manco Mfg. Co., Bradley, Ill.



Put plant traffic on a safe road

with strong, easy-to-erect Armco Guardrail

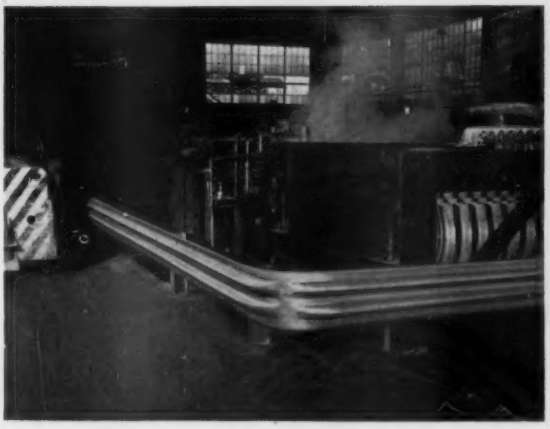
Armco FLEX-BEAM Guardrail installed in a parking lot at Bendix Products Division, Mishawaka Plant, Mishawaka, Indiana. Note stall markings on the rail. No danger of wearing off and they are easy to see, even with snow on the ground.

Protects Machines and Equipment; Guides Traffic, Promotes Safety

You can use highway-tested Armco FLEX-BEAM® Guardrail to add safety and convenience to plant traffic. The cost is low.

FLEX-BEAM is a beam-type, deep corrugated steel rail (10 or 12 gage) that resists severe impact, yet flexes slightly to cushion the shock of a collision. You can attach it easily to almost any kind of post. Eight bolts join 12-foot sections. Maintenance is no problem. An occasional painting keeps FLEX-BEAM highly visible. The corrugated surface reflects light from any direction.

Put Armco FLEX-BEAM Guardrail to work inside and outside *your* plant at key points like plant entrances, parking lots, aisleways, structural supports for your buildings, and around valuable machinery and equipment. Write us for complete information about Armco FLEX-BEAM Guardrail. Armco Drainage & Metal Products, Inc., 3637 Curtis Street, Middletown, Ohio. Subsidiary of Armco Steel Corporation. In Canada: write Guelph, Ontario. Export: The Armco International Corporation.



Wandering trucks cannot damage this important production equipment. FLEX-BEAM provides complete protection. Guardrail also makes definite separation of work area and busy traffic aisle.

Armco FLEX-BEAM Guardrail

ARMCO®

For more facts circle 571 on Reply Card

NEW PLANT CONSTRUCTION —advance information on location, costs

Fremont, Calif.—Mack Trucks, Inc., Plainfield, N. J., plans to construct a truck manufacturing plant on a 50-acre building site in the southwestern section of this city. Construction of the new plant will get under way soon for completion by early 1959.

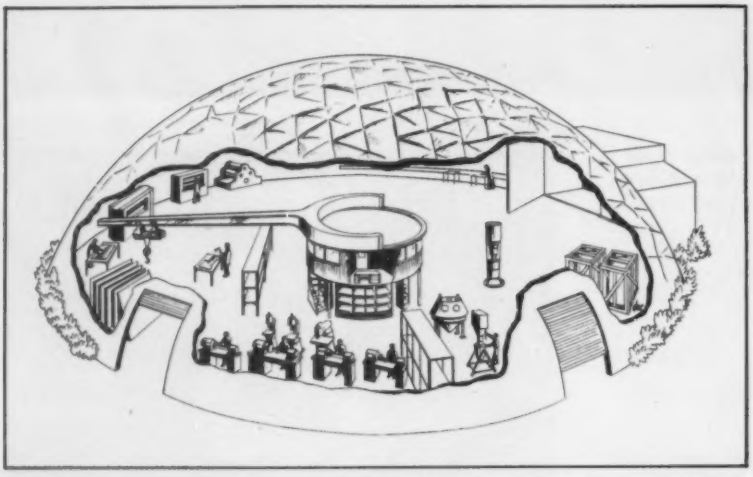
Lathrop, Calif.—California Ammonia Co., plans to construct a new 100-ton per day anhydrous ammonia plant on company site near here. Macco Corp. has been awarded the engineering and construction contract. Plant will get under way soon with completion scheduled for early 1959. Plant when completed will cost approximately $4.8 million.

Los Angeles, Calif.—Wilson & George Meyer & Co., and Wilson Meyer Co., Pacific Coast sales representatives for Eastman Chemical Products Co., Inc., a subsidiary of Eastman Kodak Co., plans to construct a new office building, warehouse and tank farm. The Meyer firm has engaged the services of the William J. Moran Co. for the construction contract reported to be about $500,000. Ground will be broken soon and the plant is scheduled to be in operation by the summer of 1958.

Newport Beach, Calif.—Aeronutronic Systems, Inc., new West Coast subsidiary of Ford Motor Co., 3000 Schaefer Rd., Detroit, Mich., announced the acquisition of a 200-acre building site where it plans to build a multi-million dollar research, development and prototype center. Center will be made up of offices, engineering and scientific laboratories, prototype manufacturing facilities and experimental installations. Construction will begin at once and will cover more than 500,000-sq ft of floor space. Estimated cost of the seven story project, including land, is estimated to run in excess of $8 million.

Wallingford, Conn.—American Cyanamid Co., Industrial Chemicals Division, 30 Rockefeller Plaza, New York 20, N. Y., plans to expand company facilities to increase production of melamine and urea compounds. Added production facilities will increase plant output by about 50 per cent. Construction of the new building is already under way.

Tampa, Fla.—Globe-Union Co., Inc., 900 E. Keefe Ave., Milwaukee 1, Wis., manufacturers of automobile storage batteries, spark plugs, roller skates, electronic equipment, television apparatus, plans to construct a large plant for the production of automobile storage batteries of all types. Work on large one-story structure will get under way at once for completion by early 1959. Cost reported to be in excess of $1.5 million.



Sketch shows the stressed skin aluminum dome which will be built at Abilene, Kansas, to house production facilities of Fi Fo Conveyor Co., div. of Vacu-Blast Co. The dome structure was developed by Kaiser Aluminum and Chemical Corp.

Chicago, Ill.—Inland Steel Co., 38 S. Dearborn St., has authorized a major expansion of company's facilities for the production of steel. Present expansion program, to cost an estimated $280 million, will increase steel production to 6,300,000 tons annually by the end of 1959.

Indianapolis, Ind.—Glidden Co., 10999 Madison Ave., Cleveland 2, O., plans to construct a new plant for the production of edible protein, a soybean derivative, on large site here. New facility will get under way at once and will be a three-story structure. Company's Chemurgy Division of Chicago, Ill., will operate the plant upon completion. Plant when completed will represent an investment of $4 million.

Whiting, Ind.—Union Carbide Corp., 30 East 42nd St., New York 17, N. Y., plans to construct new plant for the production of high pressure polyethylene for plastics. Work will get under way soon for scheduled completion in the first half of 1959.

La Place, La.—E. I. du Pont de Nemours & Co., Inc., Film Division, Nemours Building, Wilmington, Del., plans to construct a new plant for the production of linear polyethylene resins on a 600-acre site recently acquired for the purpose. Engineers are already at work drawing up building plans.

St. Louis, Mo.—Chrysler Corp., 344 Massachusetts Ave., Detroit, Mich., plans to build an assembly plant for the production of Plymouth automobiles, near suburban Valley Park. Company is in process of securing a 200-acre tract of land on the Merrimac River and construction of the plant will begin as soon as possible. Plant is scheduled for completion in time to assemble 1960 Plymouths and will have an initial capacity of 960 cars daily. New facility will cost an estimated $50 million when completed.

New York, N. Y.—Linde Air Products Co., a division of Union Carbide Corp., 30 E. 42nd St., has announced plans for extensive new facilities for the company's Tonawanda Research Laboratories. Construction will begin soon on a large high-pressure laboratory, a metallurgic laboratory, a new hydrocarbon storage building and a new service building.

Niagara Falls, N. Y.—Hooker Electrochemical Co., 1940 Ward St., plans to construct a new research center on Grand Island, near Niagara Falls. Initial facilities are scheduled for completion by late 1958 or early 1959. Work clearance of the property is already under way. Plant when completed will represent an investment in excess of $3.5 million.

Tonawanda, N. Y.—American Brake Shoe Co., 230 Park Ave., New York 17, N. Y., plans to construct a new plant for the manufacture of cast steel railroad car wheels at location here, instead of Le Roy, N. Y. Preliminary planning and property negotiations are already under way for the new facility, estimated to cost better than $6 million. Plant is tentatively scheduled to be in production by early 1959.

Evendale, O. — Formica Co., 4615 Spring Grove Ave., Cincinnati, O., manufacturers of laminated plastic board, has announced a major expan-

(Continued on page 234)

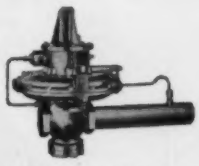
METER YOUR INDIVIDUAL FURNACES TO CONTROL QUALITY AND COSTS

When you process with gas, metered records of consumption will quickly show up combustion deficiencies that affect the quality of your end product. Meters standing guard at every burner will discourage wasteful fuel practices. And only from metered records of the fuel used can you arrive at accurate costs.

Why don't you investigate the advantages of metering individual furnaces, kilns or ovens? Learn the economies of using Rockwell meters as production tools. *Write us or use the handy coupon.*

Good Combustion Requires Close Regulation

For Low Pressure Burners



For High Pressure Burners

Good combustion control is the key to good process control. Rockwell makes a complete line of pressure regulators for all types of industrial burners. Use the coupon for full details.

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GAS METERS
and REGULATORS

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Rockwell Manufacturing Company
Pittsburgh 8, Pa.

Gentlemen:

I am interested in your meters for measuring gas to individual furnaces ☐. Your pressure regulators for burner control ☐. Please send literature ☐. Have representative call ☐.

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you get EXTRA PROTECTION
plus Extra Economy with
ECONOMY FUSES

Economy Fuses give you Extra Protection with such built-in superiorities as:

Specially Developed Metal Alloys
These alloys, because they are developed to meet specific requirements, assure "quick as a wink" action when the danger point is reached. Yet they also assure extra protection against needless fuse blows due to sudden power surges or current fluctuations.

In addition to this extra protection, Economy brings you the extra advantage of a

Complete Line of Fuses
Nearly 400 types, sizes and capacities enable you to select exactly the right fuses, specially engineered to best meet your requirements.

Extra Protection *plus* Complete Line Selection add up to extra economies such as:

- Reduced fuse replacement costs
- Fewer repairs
- Longer life for electrical equipment
- Reduction of work stoppages due to fuse blows

NEARLY 400 TYPES, SIZES AND CAPACITIES

ECO® ONE-TIME CARTRIDGE FUSES
Knife blade and ferrule types, sizes from 2" to 13¾" and up to 600 amps for both 250 and 600 volts.

ARKLESS® MECHANICAL INDICATING FUSES
Knife blade or ferrule types, sizes from 2" to 13¾"; up to 600 amps in both 250 and 600 volts.

DELAY® RENEWABLE CARTRIDGE FUSES
Knife blade or ferrule types, sizes from 2" to 13¾"; to 600 amps, 250 volts and 600 volts.

ECONOMY RENEWABLE PLUG FUSES
Available in standard and sub-standard sizes; from 10 to 30 amps for 125 volts.

CLEARSITE® PLUG FUSES
Available in both standard and sub-standard sizes; from 1 to 30 amps.

ECON® DUAL-ELEMENT CARTRIDGE FUSES
Knife blade and ferrule types; from 0 to 600 amps, 250 and 600 volts.

ECONOMY FUSTATS
Resist tampering and over-fusing. Available from 1 to 30 amps.

ECONOMY FUSE PULLERS
Treated and sealed to minimize moisture absorption. Withstand breakdown test of 35,000 volts dry.

ECONOMY CLIP-TITE
Positive protection insures tight electrical contacts of fuse clips. Prevents heating of contacts.

Economy Trade Name fuses carry full Underwriters' Laboratories approval and listing.

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SEND TODAY *for your FREE Economy Fuse Folder No. 3. This handy size folder lists the nearly 400 sizes, types and capacities of fuses available.*

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MOLDED CASE CIRCUIT BREAKERS

The I-T-E Cordon plug-in circuit breakers pictured in the control board above distribute current to machines in the Yorklyn, Del., plant of National Vulcanized Fibre Co., world's largest manufacturer of vulcanized fibre.

"We selected I-T-E breakers to solve our problem in the manner we desired," says John L. Bahr, chief engineer for National Vulcanized Fibre Co.

"I-T-E CORDON® Plug-in Breakers Proved the Most Economical and Convenient Way to Meet Our Increased Power Capacity Needs"

"The growth of our company over the years required the addition of a public utilities tie line into our Yorklyn, Del., plant to supplement the plant's generating facilities. This move created two problems: it meant that we would have to substantially increase the maximum potential current interrupting capacity of our control board; and within a limited amount of space available.

"After considering several possibilities, we found that I-T-E Cordon plug-in type circuit breakers would solve both problems. We were able to satisfy our interrupting capacity requirements in the existing control board space. And plug-in features permit taking out any circuit when necessary without shutting down the entire board."

I-T-E Cordon circuit breakers combine the usual thermal magnetic trip unit for protection against overloads with current limiting Amp-traps,* which assume the fault clearing duty when actual short circuits occur. Thus I-T-E Cordon circuit breakers extend the interrupting capacity to 100,000 rms amperes without the necessity of designing special structures for maximum available shorts. Ask your I-T-E representative for complete details or write Small Air Circuit Breaker Division, 19th & Hamilton Streets, Phila. 30, Pa.

**Amp-trap is a registered trademark of the Chase-Shawmut Co.*

SMALL AIR CIRCUIT BREAKER DIVISION

I-T-E CIRCUIT BREAKER COMPANY

19TH AND HAMILTON STREETS, PHILADELPHIA 30, PENNSYLVANIA

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FLAMMABLES CONTROL METHODS AND PRACTICES IN PRODUCTION, PROCESSING AND IN MAINTENANCE

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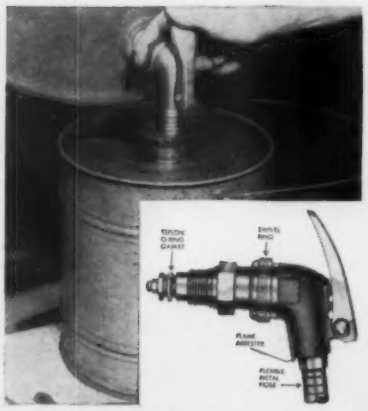
Fire-safe economies in dispensing flammable liquids from drums

Fire-safe, controlled dispensing...no waste solvent . . . no spillage . . . accurate, measured flow . . . unauthorized withdrawal of liquids prevented . . . with Protectoseal Underwriters' Laboratories Approved Safety Drum Transfer Pump. Three fire baffles built-in at critical points. Result — flammable liquids dispensed economically, quickly, with protection against fire and explosion.



No more leaky drum faucets... where faucet connects with drum or from faulty, dripping valve seat . . . with Protectoseal Factory Mutual Approved Safety Drum Faucet. Self-positioning spout on swivel avoids stripped threads . . . Teflon O-Ring gasket universally impervious to all solvents . . . no distortion, shrinking or deterioration. No damage to valve seat because of its location at inlet end of faucet. Built-in fire baffle prevents flashbacks...flexible metal hose attachment forms static-free ground. Result—flammables dispensed safely . . . far longer service life.

For Further Information
Request Drum Dispensing File No. 69

Prevent spray gun clogging . . . cut lost production time . . . avoid excessive maintenance costs

Spray gun nozzle held securely in liquid solvent when not in use . . . prevents paint hardening . . . keeps spray gun openings free. Spray gun packing and lubricating oils protected . . . fewer parts replacement . . . solvent guarded from fire by metal fire baffles over gun port openings.

Result—spray guns always ready for instant use.

Large automobile manufacturer reports—"saves 4 hours spray gun cleaning time daily."

For Further Information
Request Spray Gun Receiver File No. 59

Automatic washing of spray masks . . . more production . . . less spoilage

Paint spray masks washed while operator continues production line work . . . masks always clean and ready for instant use. No production part spoilage or lost time due to dirty, inaccurate spray masks. Cleaning solvent protected by fusible link which automatically closes cover to snuff out fire.

For Further Information
Request Automatic Spray Mask Washer File No. 73

"Little Helper" safely speeds core-box cleanups

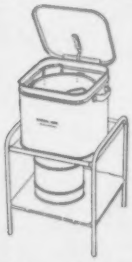
Foundry production speeded . . . fewer imperfect cores. Sand, oil and

dirt deposits removed faster—easier. Special container safely stores cleansing solvent . . . feeds brushes, wiping cloths fast. No chance of fire . . . no waste solvent . . . no hazardous spillage.

For Further Information
Request Plunger Can, Bench Can Dispenser File No. 50

Complete parts washing station takes only 2¼ sq. ft. floor space

Set beside production machines . . . includes work-high stand with large capacity safety wash tank and parts basket . . . 5-gallon safety storage can on shelf below provides instant auxiliary solvent supply. Self-closing wash-tank cover with fusible link attachment closes instantly in presence of fire. Production parts cleaned safely, thoroughly and drained at one location . . . in minimum floor space.



For Further Information
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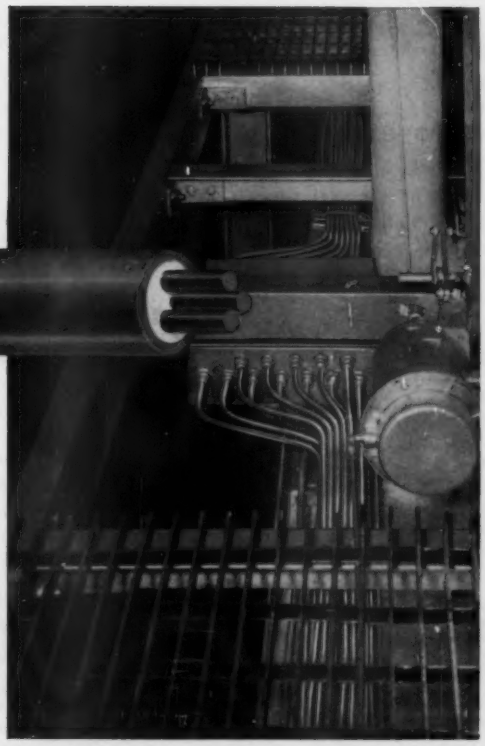
SAFETY m.i. CABLE

the answer to industrial power wiring...



- SPACE SAVING
- Time saving
- Permanent
- INSTALLED EASILY
- Fast power wiring to cut down-time

More and more General Cable's Safety MI 600 Volt Wiring System is being used because it can take the abuse of industrial application, giving trouble-free operation and unexcelled performance under the most severe conditions. Particularly adaptable in hot and wet locations. Available in 1, 2, 3, 4 and 7 conductor for power and control circuits.

MI terminating in main Japan Oven control center switchboard at Poinsett Lumber and Manufacturing Company, Anderson, S.C.

Ask for a Demonstration To-Day!

GENERAL CABLE CORPORATION, 420 Lexington Avenue, New York 17, N. Y.
Offices and Distributing Centers Coast-to-Coast

for quality and service...specify **GENERAL CABLE**

For more facts circle 576 on Reply Card

specialized

Does a business publication advertising pay?

No one is in a better position to give a hard-boiled, practical answer to this question than the men who spend their working lives on the sales front ... the men the ads are supposed to help ... the men who sell.

Here are the statements of salesmen who know what advertising does for them when it appears in the industrial, trade or professional publications that serve the specialized markets to which they sell:

Bill Kramer
Monsanto Chemical Co.
sells to industry

says Mr. Kramer:

"We make many different chemicals, mostly standardized products that don't have trade names. Many of our chemicals are purchased in small quantities direct and through distributors. So you might think that all I have to sell is price. That's not true. Thanks to our advertising in business papers the name '*Monsanto*' is known to stand for quality products and service.

"We have so many small customers I can't call on all of them, so advertising must carry a large part of the load for the small orders we get from such people which add up to a great deal of tonnage. Advertising also gets across the fact that we warehouse standard chemicals right here in the city and can give prompt service.

"We have such a long list of chemicals that I wouldn't do much of a sales job if I just read the list of chemicals we make on each sales call. So again our company uses advertising to let the people know all the different chemicals we are prepared to deliver. Then we salesmen can concentrate on the individual prospect's immediate requirement.

"Of course you don't always know exactly what chemicals are required by a particular prospect because a company can go into a new product, or a variant of an old one, almost overnight and come up with a need for a chemical he'd never used before. So it's pretty important for our advertising to remind all buyers just what lines we have.

"Although many of our chemicals don't have trade names, we have one silica product that has become known to the trade as '*Santocel*'. Very few people in the trade call this by its proper chemical name – they refer to it as '*Santocel*'. Advertising in the trade papers has created this new name and made it stick. These are just some of the ways I know advertising is working for me – calling on people I can't get to see and calling more often than I can possibly do in person, and suggesting new uses for our products."

Harold Robus
Shuron Optical Company
sells to wholesalers

says Mr. Robus:

"My direct customers are wholesalers—distributors with optical laboratories who sell to and fill prescriptions for optometrists, ophthalmologists and opticians. These men in turn are my secondary, though nonetheless important, customers. I do a lot of so-called missionary work with them, and I also write a lot of orders that are billed, of course, through the wholesaler of their choice.

"My company's trade advertising in professional journals is directed to these men who examine eyes and dispense eyewear. It has several purposes. First, it sells the company and its policies. Then we use it to introduce new products and all important specifications such as styles, colors, sizes and availability. Another aim of our advertising is to keep the 'retailer' sold on products that he has ordered from me or from his wholesaler.

"I know our advertising does a job when I hear constant references to 'the SHURON ad I saw recently' or 'that new frame I saw in your ad.'

"It has been my experience that all three types of advertising are important, but that keeping the 'retailer' sold on SHURON products is the most vital. It helps bolster his confidence in his own judgment and cuts down my competitors' chances of selling him between my calls.

"Yes, I list advertising as No. 2 in importance in selling our products. When I put it in second position I put it ahead of salesmen. Here's the way I see it. Number one—you have to have a good product. Number two—you have to have a good advertising campaign. Number three—you have to have good men to follow up the advertising.

"That's my opinion."

Glen Chase
Yarnall-Waring Company
sells to industry

says Mr. Chase:

"I have been selling *Yarway* products for over seven years, and I'll have to admit that I've taken the trade paper advertising for granted. But when I stop to think I realize it's out there working for me all the time.

"For instance, I never have to tell my prospects who YARNALL-WARING is, or what they make. Often I don't even have to tell them why they should see me and find out what I've got to offer. The advertising has done much of the *who, what,* and *why* of selling before I make my contact.

"Here's an example: I recently had a phone call from a potential customer that I'd never even called on. He was having trouble with a competitive product. He'd seen our ads and wanted to try my product. That's one time when my sale consisted merely of writing the order. Advertising really made the sale.

"The advertising has given people a good impression of our company, too. This is surprising, when you stop to think about it, because we are a relatively small organization.

"Our company name is YARNALL-WARING but a great many people say *'Yarway'*. I believe this use of our trade-mark may be due to the wide use of the company trade-mark in our trade paper advertisements, on our product name plates, shipping cartons and stationery."

Ask your own salesmen what your company's business publication advertising does for them. If their answers are generally favorable, you can be sure that your business publication advertising is really helping them sell. If too many answers are negative, it could well pay you to review your advertising objectives—and to make sure the publications that carry your advertising are read by the men who must be sold.

How salesmen use their companies' advertising to get more business

Here's a useful and effective package of ideas for the sales manager, advertising manager or agency man who would like to get more horsepower out of his advertising. Send for a free copy of the pocket size booklet entitled, "How Salesmen Use Business Publication Advertising in Their Selling," which reports the successful methods employed by eleven salesmen who tell how they get more value out of their companies' advertising.

You'll find represented many interesting variations in how they do this. Some are very ingenious; all are effective. You can be sure that more of your salesmen will use your advertising after they read how others get business through these simple methods.

The coupon is for your convenience in sending for your free copy. Then, if you decide you want to provide your salesmen with additional copies, they are available from NBP Headquarters in Washington, at twenty-five cents each. Or if you choose you can reprint the material yourself and distribute it as widely as you please. But first, send for your free copy.

NATIONAL BUSINESS PUBLICATIONS, INC.

NBP

...each of which serves a specialized market in a specific industry, trade or profession.

NATIONAL BUSINESS PUBLICATIONS, INC.
Department 5A
1413 K Street, N. W.
Washington 5, D. C. STerling 3-7533

Please send me a free copy of the NBP booklet "How Salesmen Use Business Publication Advertising in Their Selling."

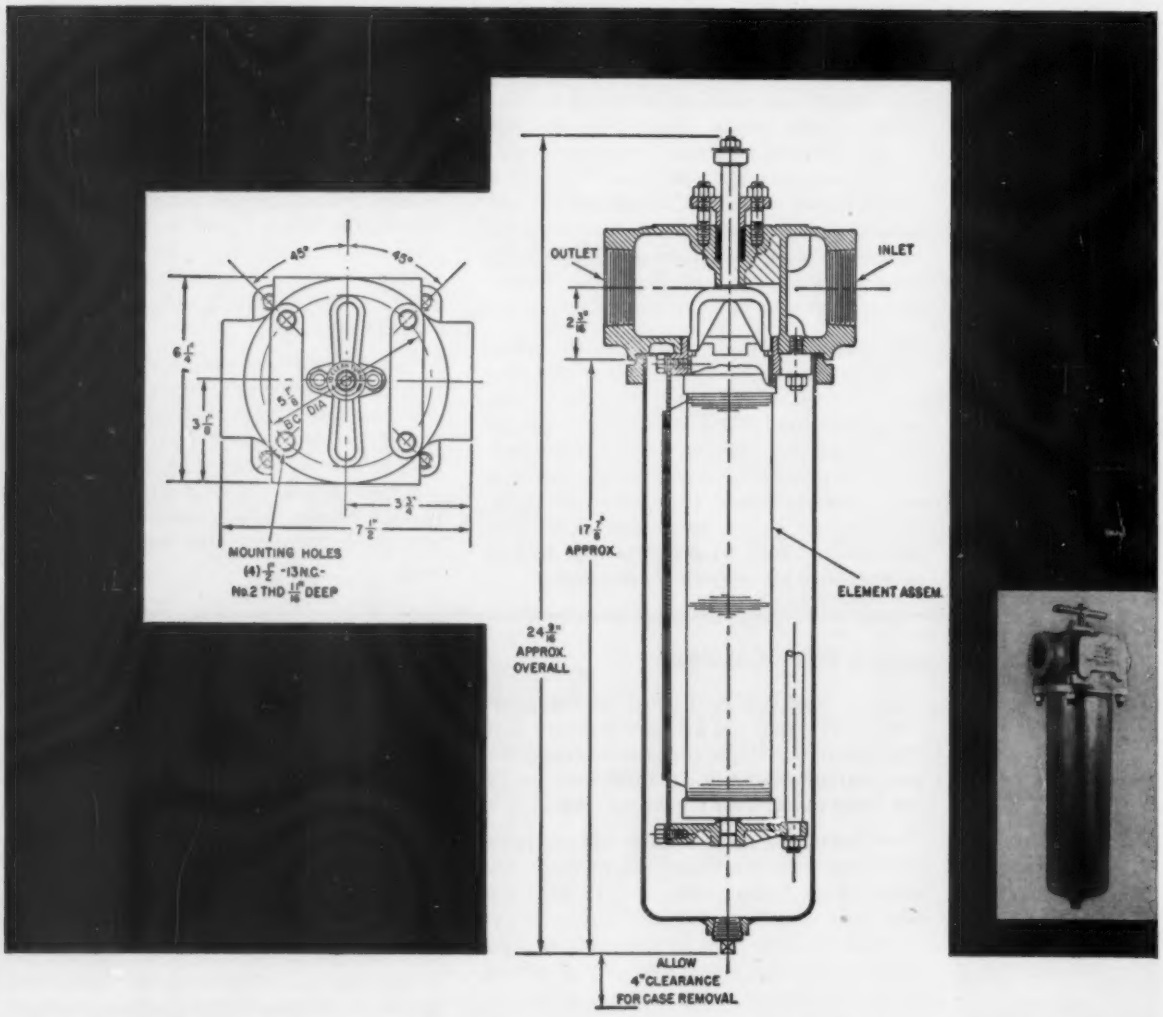
Name _____

Title _____

Company _____

Street Address _____

City _____ Zone _____ State _____



Your "special" filtration problems can be solved by standard Purolator filters

FOR EXAMPLE...This one standard Purolator filter is exactly right for all these "special" filtration problems:

inks, paints,
varnishes, machine tool coolants,
greases, vitamin solutions,
as well as fuel and lube oils.

This filter's specifications may recommend it for a problem of yours. If not, you're almost certain to find a standard Purolator filter that does meet your needs—exactly.

SPECIFICATIONS...This is Purolator filter model G-141J with simplex full flow metal element oil strainers. It is designed for primary or first stage filtration and can be installed on pressure or suction side of pump. Recommended for maximum capacities of 40 to 80 GPM, dependent on spacing which varies from .003 to .010. Relief valves set from 10-12 to 50 PSI are incorporated in several models. Motor driven knife blade to clean element can be furnished whenever conditions make manual rotation impractical. Head is made of high tensile cast iron, body of drawn steel. Inlet and outlet connections are 2″, drain plugs are provided. Maximum pressure: 125 PSI; weight: 37 lbs.

Remember, if these specifications don't match your needs, there's probably a filter that does at Purolator. Find out. Send in your problem.

Filtration For Every Known Fluid

PUROLATOR

PRODUCTS, INC.

Rahway, New Jersey and Toronto, Ontario, Canada

For more facts circle 578 on Reply Card

General Electric says:

"G-E Lamp users will keep getting more and more light . . . without adding fixtures or increasing lamps."

L. E. Wilson, plant engineer, says:

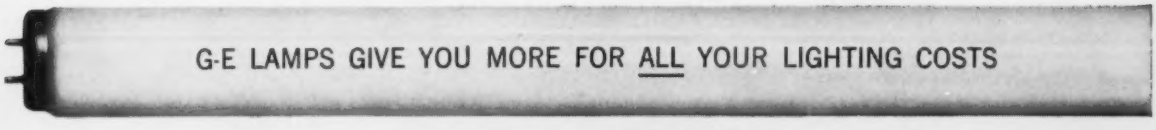
"G-E Lamps gave our plant a light level of 23 footcandles in 1943. By 1950 it was 30. Today it's 40! And we're using the same number of fixtures, the same number of G-E Lamps!"

"G-E Lamps have kept this lighting installation up to date at no extra cost," says L. E. Wilson of Cleveland Graphite Bronze Company (division of Clevite Corporation.) William Bode (right), utilities engineer, checks light level with H. D. Hanson, safety director.

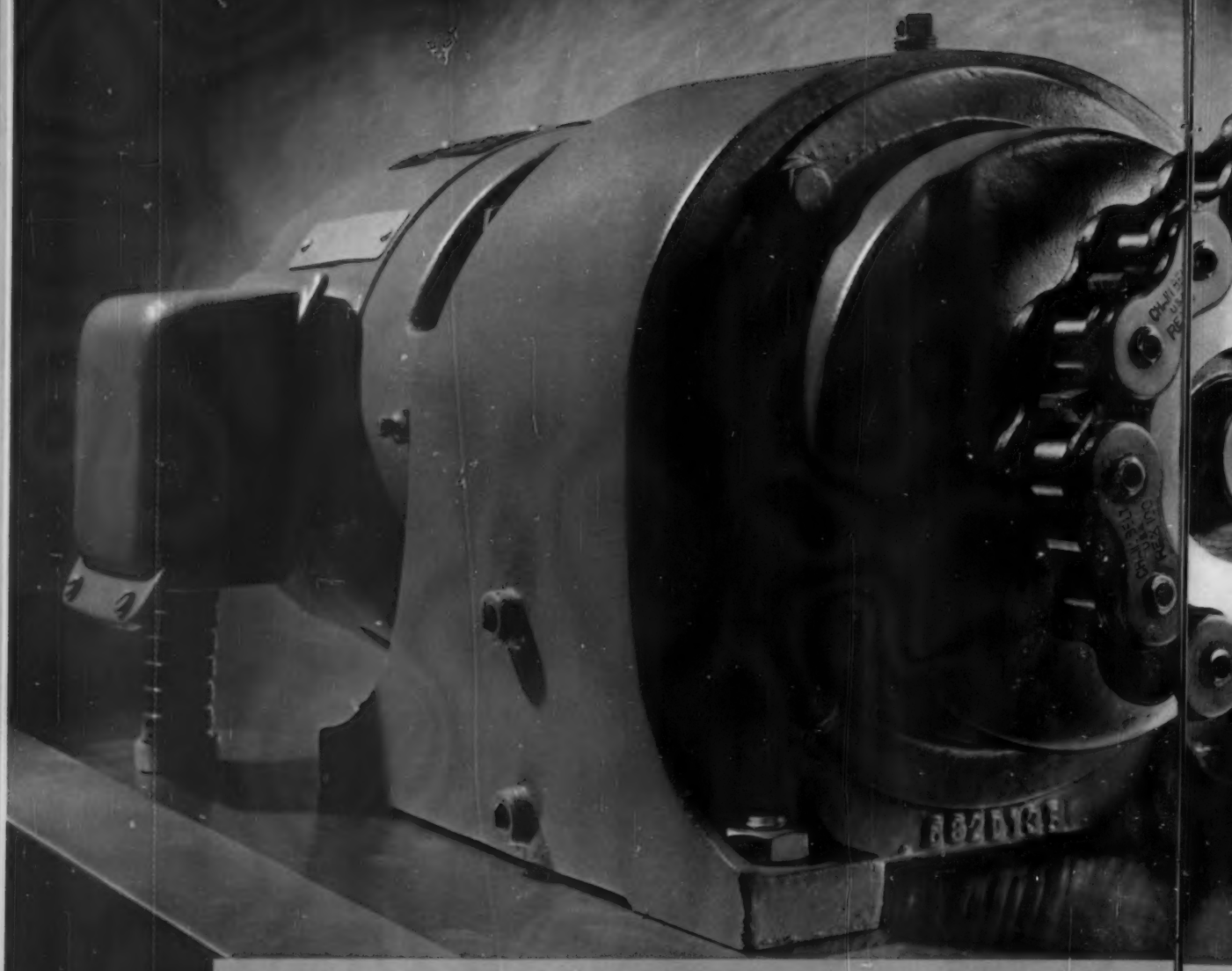
ONE of the surest ways to get full value for all your lighting costs is to use G-E Lamps *exclusively*. Then you know the lamps you are using are keeping your lighting system up to date because they contain the latest lamp improvements from General Electric research. Customers who have used the G-E 40-watt fluorescent lamp, for instance, are getting 30% more light today than they did in 1950—from the same fixtures, the same wattage. Across the board, today's G-E Lamps give you more for all your lighting costs. General Electric Co., Large Lamp Dept. PE-127, Nela Park, Cleveland 12, Ohio.

Progress Is Our Most Important Product

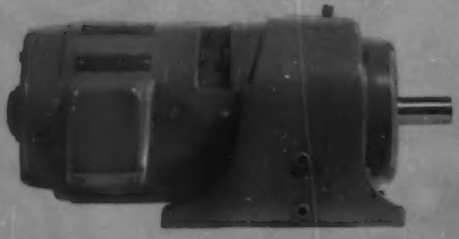
GENERAL ELECTRIC



A great gear-motor

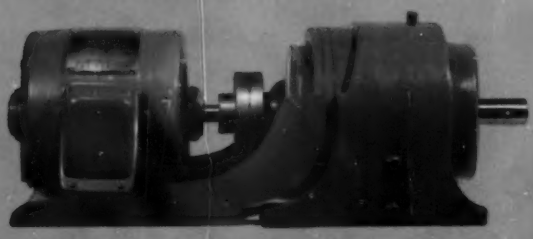


NEW integral unit



Compact, one-piece unit has complete, easily removable motor, machined-in alignment.

NEW all-motor unit



Providing wide application flexibility, motor change may be accomplished without disturbing gear.

General Electric's NEW gear-motor line

Now, you can meet all your low-speed drive requirements from a brand new line of General Electric packaged power transmissions. This 3-unit line is based on a new, completely simplified, helical design that has evolved from General Electric's 25 years of gear-motor engineering and application experience. And it's a line that can provide you with important, 3-way savings on all low-speed applications.

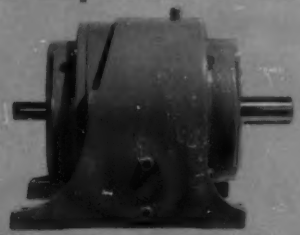
1. Greater reliability: This new line incorporates the most advanced gear manufacturing methods and all units are factory tested before shipment. In addition, you benefit because you purchase both motors and gears from a single manufacturer.

2. Easier Maintenance: A cinch to assemble and disassemble, alignment is machined right into each unit. Gear components may be carried in stock as sub-assemblies, minimizing downtime for normal repair.

3. Reduced inventory: You can reduce your inventory with no sacrifice to your operating continuity. Parts standardization and interchangeability permit a basically lower inventory investment.

This new line was developed to keep pace with the new requirements and wider applications of gear-motors brought about by advanced manufacturing techniques. *Get complete information from your nearest Apparatus Sales Office or Distributor—or write for bulletin GEA-6704, containing line highlights, to General Electric Co., section 851-6, Schenectady, N. Y.* Gear-Motor and Transmission Components Dept.

NEW separate reducer



Unit can provide a variety of output speeds with change of belt or chain rates.

Progress Is Our Most Important Product

GENERAL ELECTRIC

LOW COST DIFFERENCE BETWEEN

SLIPPING FEAR

SAFETY

Pattern actual size

Eliminate slipping fear and increase efficiency by installing A.W. Super-Diamond—the low cost safety floor plate that takes the danger out of hazardous slipping areas.

Stops skids and slips *with*	Raised steel figures *diamond-shaped for maximum slip-skid resistance from all approach angles*
Get maximum wear *with*	Tough rolled steel floor plate
Easily fabricated *with*	Ordinary shop equipment
No matching problems *with*	Non-directional pattern—minimum waste
Cleans, drains rapidly *with*	No maintenance problems
Solve your slipping problem *with*	A.W. Super-Diamond as independent flooring, as an overlay—or used structurally.

For complete information write on company letterhead to Dept. **SD-S9.**
No other floor plate can match A.W. Super-Diamond's safety and durability at so low a cost.

A.W. SUPER-DIAMOND
ROLLED STEEL FLOOR PLATE

Wherever oil, grease, or other substances raise special slipping accident hazards, we suggest a check on the special non-slip qualities of A.W. ALGRIP—the world's only abrasive rolled steel safety floor plate.

ALAN WOOD STEEL COMPANY • CONSHOHOCKEN, PA.

Other Products: A.W. ALGRIP Abrasive Rolled Steel Floor Plate—Plates—Hot and Cold Rolled Sheet and Strip—(Alloy and Special Grades)

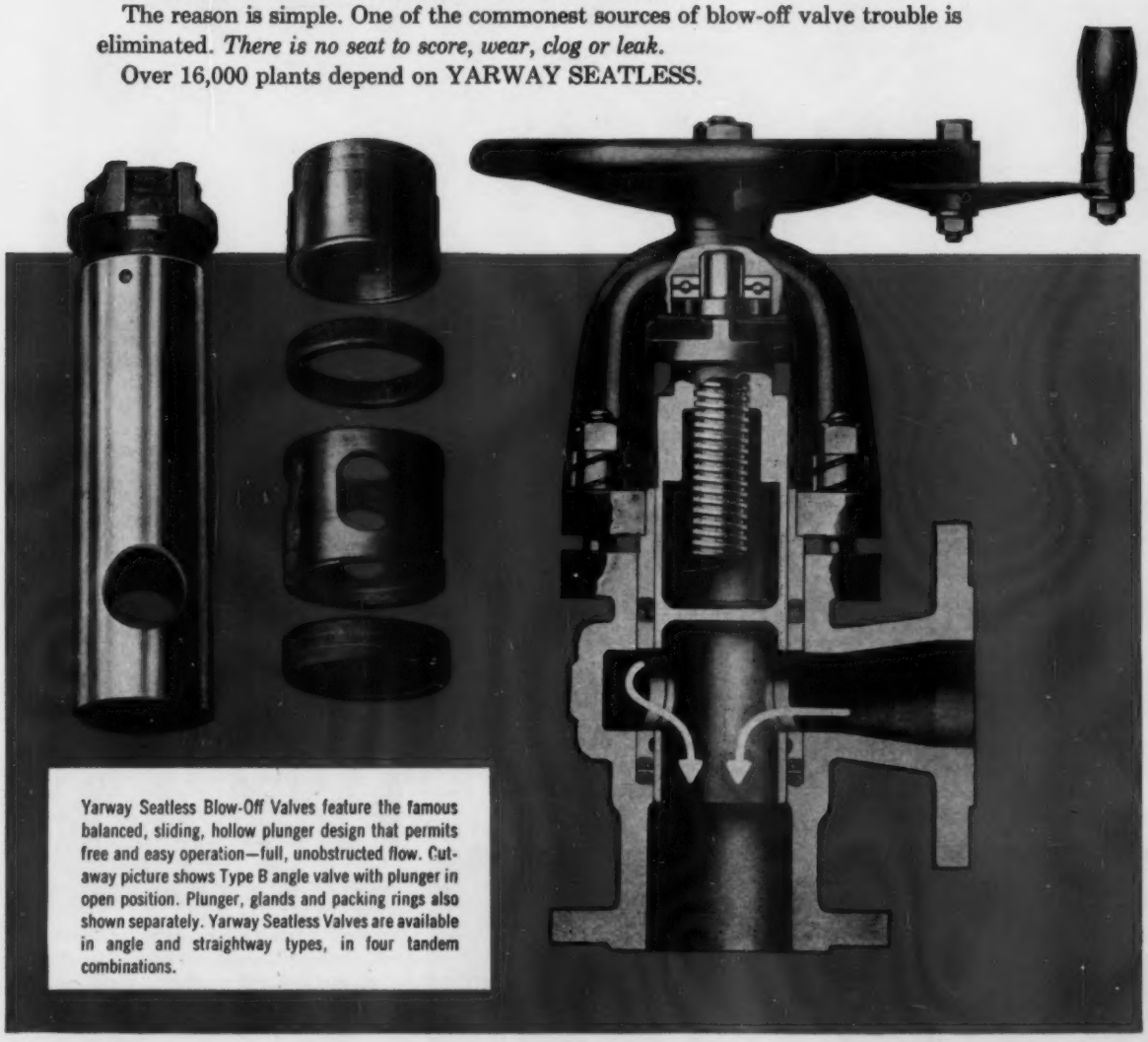
For more facts circle 581 on Reply Card

seatless means savings

For nearly 50 years boiler plants in low and medium pressure ranges have been saving maintenance time and down-time thanks to dependable, trouble-free blow-down service from Yarway Seatless Blow-Off Valves.

The reason is simple. One of the commonest sources of blow-off valve trouble is eliminated. *There is no seat to score, wear, clog or leak.*

Over 16,000 plants depend on YARWAY SEATLESS.



Yarway Seatless Blow-Off Valves feature the famous balanced, sliding, hollow plunger design that permits free and easy operation—full, unobstructed flow. Cut-away picture shows Type B angle valve with plunger in open position. Plunger, glands and packing rings also shown separately. Yarway Seatless Valves are available in angle and straightway types, in four tandem combinations.

For information on Yarway Seatless Valves, sizes, materials, pressures, etc., write

YARNALL-WARING COMPANY 145 Mermaid Ave., Philadelphia 18, Pa.
BRANCH OFFICES IN PRINCIPAL CITIES

YARWAY SEATLESS ...a good way to specify blow-off valves.

For more facts circle 582 on Reply Card

NEW PRODUCTS AND PROCESSES summarized for your convenience

Edited by M. E. Heniken

1—DUST FILTER features roller cleaner action

The Roll-Clean Dynaclone Dust Filter is reported to retain basic advantages of company's original Dynaclone while providing a more efficient method of cleaning collected dust from filter bags. The roller cleaner moves back and forth across open ends of filter bags sealing each bag as it is being cleaned by atmospheric air. This cleaning air is brought by main operating fan while filter continues to operate. Manufacturer explains that because of its simplified design, the Roll-Clean provides more cloth area, therefore greater filtering capacity, easier filter bag changing due to elimination of "false" wall in clean-air chamber (any bag can be removed without disturbing others), complete dust seal provided by rubber rolls which block off adjacent bags, and easy access for inspection and servicing. Rolls are made of gum rubber combined with an inner filling of sponge rubber, providing maximum resiliency. The W. W. Sly Mfg. Co.

More information on any of these products can be yours without cost or obligation. Just circle the item numbers on the Reader Service Cards provided on pages 237-238.

3—LIGHTWEIGHT WINCH stars on heavy duty jobs

Model 61 is announced as a 35-lb winch with a self-contained motor and a lifting capacity of 6,000 lb. Winch is small enough to be carried in one hand, making it quickly available for countless tasks. It has a standard 400-cycle, self-contained a-c motor. Where necessary, 28-v d-c, 110-v a-c d-c or hydraulic drives can be used. The reel-in rate is 10 fpm at capacity load of 6,000 lb. A number of load-speed design combinations are possible up to that limit. A 3,000 lb load, for example, can be reeled in at 20 fpm. All American Engineering Co.

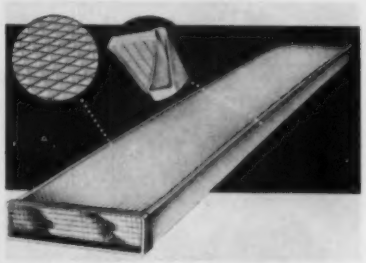
2—PICK-UP SYSTEM gets the waste out of plants faster

Using the Dempster-Dumpmaster Model CA, this industrial waste collection system consists of a truck-mounted top bay compactor body and mechanical lifting arms working in connection with waste-storage containers located at points of waste accumulation. Moving from one location to the next, the driver uses the lifting arms to pick up the containers and dump the contents through the top bay of the compaction body where average waste material is hydraulically compressed to a third of its former volume. This lets the truck load more than 60 cu yd of material before traveling to the disposal area.

The pick-up, dumping and returning cycle is said to take less than 60 sec, and is accomplished without the driver leaving the cab. According to company, a 6 cu yd container holds the equivalent of forty 30-gal trash cans which would require 1.3 man hours to empty under good conditions. Containers come in capacities from 1 to 6 cu yd. The service is offered to plants on an outright purchase basis, or through contract haulers who place containers in plants and empty them on a fee basis. Dempster Bros.

4—LIGHTING FIXTURE has no visible metal frames

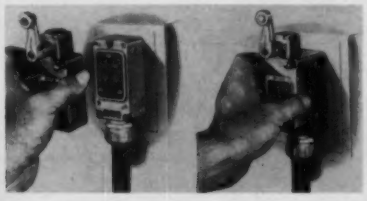
Developed to compliment modern building trends, the Catalina is a departure from current commercial lighting fixtures, in that there are no



visible metal frames or braces the full length of the fixture. When installed in continuous lines, the Catalina looks like one continuous fixture through use of extruded polystyrene plastic side panels, chemically fused to a 45-by-45 deg plastic louver to form one unit. Available for two or four lamps in 4- and 8-ft units, the Catalina has a 55 per cent upward light component when suspended and is available with top reflectors for surface mounting. Benjamin Electric Mfg. Co.

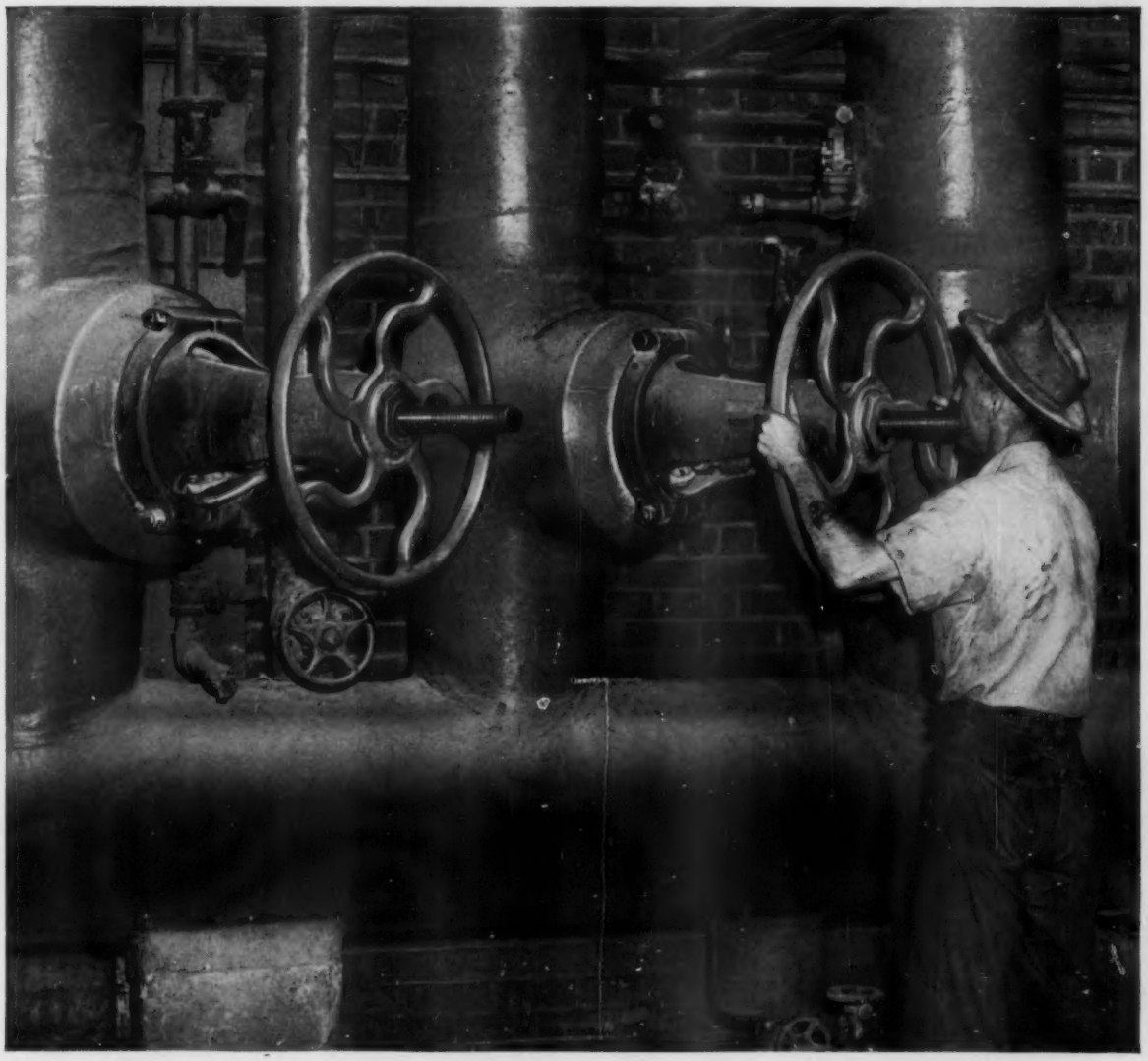
5—LIMIT SWITCH can be replaced in seconds

The Plug-In Limit is announced as a precision limit switch that can be replaced on the job in a few seconds with no required adjustments. Designated No. 201LS1, the Plug-In Limit



consists of two parts: a terminal block enclosure, containing wiring connections, and a switch enclosure, including all moving mechanical and electrical parts. The switch enclosure is fitted with four current-carrying spring plugs, integrally molded to the basic switching element, and the terminal block with four corresponding receptacles. When plugged together, they form a complete switching unit. Actuating arms may be pre-set to eliminate on-the-job adjustment. To replace the switching unit, you simply loosen two screws, pull off the switch, plug

No Bonnet-Joint Maintenance—No Bonnet-Joint Leakage



These valves helped the maintenance crew win a losing battle

This process industry plant saw the danger signal. Servicing leaky valve bonnet joints was taking too much time. Other important maintenance work was being neglected.

That's why, in 1947, when expanding the power plant, Crane Pressure-Seal Bonnet Gates were chosen for main steam service as shown above. Working pressure: 600 psi at 725 deg. F.

These Crane valves need no bonnet joint maintenance. The joint is leakproof—sealed tight by internal fluid pressure. Crane alloy seats and flexible wedge disc make closure tight and easy.

To date, the Crane Pressure-Seal Gates have given this plant over 9 years' uninterrupted service. The maintenance crew hasn't touched them except for routine care.

Full information on these modern power service valves is given in Circular AD-1936. Get a copy from your Crane Representative or by writing to address below.

Ask for Circular AD-1936

CRANE VALVES & FITTINGS

PIPE • PLUMBING • KITCHENS • HEATING • AIR CONDITIONING

Since 1855—Crane Co., General Offices: Chicago 5, Ill. Branches and Wholesalers Serving All Areas

For more facts circle 583 on Reply Card

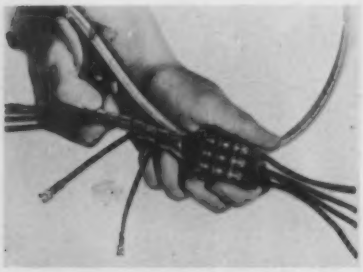
NEW PRODUCTS

(Begins on page 172)

on the replacement unit and tighten the screws. Micro-Switch, Div., Minneapolis-Honeywell Regulator Co.

6—PLASTIC WRAPPING goes around cable easily

Amp-Spirap is announced as a spirally-cut plastic wrapping that eliminates cable lacing, insulation damage and pulling of wires through spaghetti tubing. It is readily applied to wire bundles of any size up to 3½-in. diam, and permits individual wires to be entered or let out at any point. Manufacturer points out that it can be unwound to let new wires be added, and that it holds wires together tightly. A sample is offered. Amp Inc.



8—STEEL SHELVING serves many storage needs

This line of shelving equipment includes plain shelving in 240 different size combinations and ledge shelving in 735 size combinations. Three basic types are available: open type, consisting of posts, shelves and braces only; closed type having posts, shelves, backs, sides, partitions and bases; and closed type having doors and locks in addition to other equipment. Six popular standard shelving configurations can be adapted to provide variations of size, arrangement and function, by using dividers, bin fronts, label holders, etc. Constructed of heavy gage steel, shelving comes in green, gray and tan finishes. Penco Metal Products Div., Alan Wood Steel Co.

9—SURFACING METHOD for protecting metal parts

Kenplate is announced as an adaptation of Kennametal cemented tungsten carbide for hardfacing metal surfaces to protect them against abrasion and wear. The material consists of small hexagonal plates of cemented tungsten carbide assembled in a continuous pattern on an adhesive glass fiber backing to provide flexible sheets or strips for application on flat or curved surfaces. The backing holds the small plates together while they are being bonded by epoxy adhesives, silver solder, or conventional brazing materials to provide continuous surfaces.

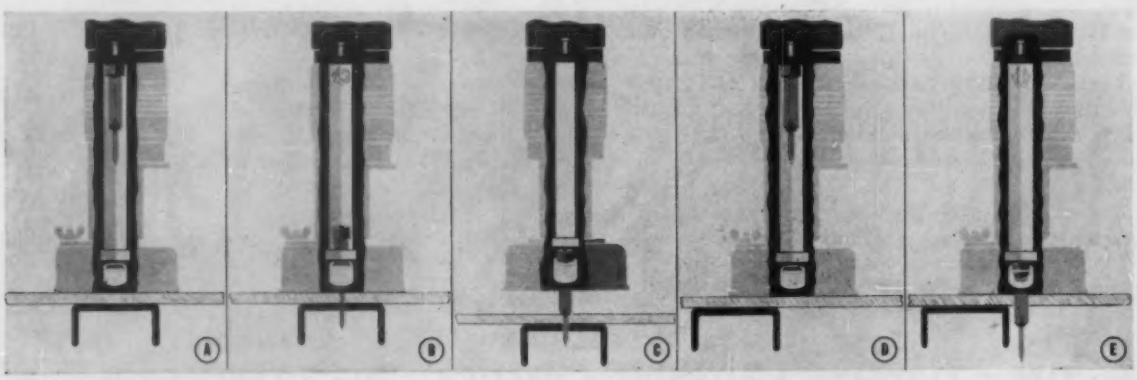
The flexible backing also simplifies application, since the basic sheets can be cut or joined in multiples to form practically any size or shape to cover flat or for curved surfaces.

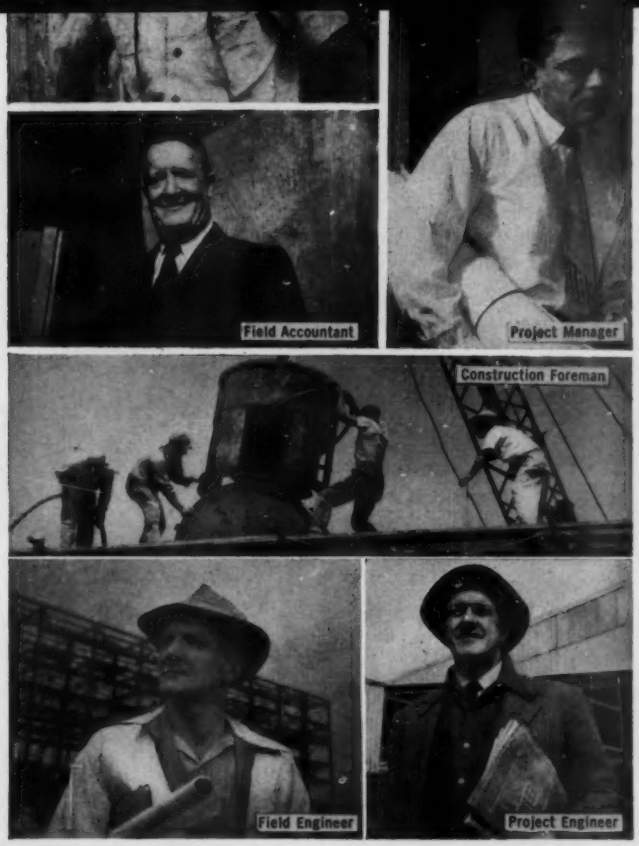
Two sizes of hexagons—0.425 and 0.210 in. across—come in three thick-

7—STUD DRIVING TOOL stops misguided fasteners right in their tracks

Model 455A Stud Driver with Model 440 Captive Stud Guard Assembly is reported to stop an alloy steel fastener in its tracks—should it be fired mistakenly into soft or insubstantial construction material. Powered by a 22-caliber blank cartridge, the tool is designed to anchor wood to steel on concrete, wood or steel to steel, or threaded fasteners directly into steel or concrete. If stud is fired, unsupported by concrete or steel backing, a captive piston, threaded to the stud, is arrested by an aluminum buffer in the guard assembly, and piston and stud are halted at the muzzle of the stud driver. In normal use, piston and buffer do not engage. However, if the tool is applied to a completely penetrable work surface, the buffer serves to arrest the piston, thereby restraining the stud.

As shown in the sketches, in normal use (A) when the tool is loaded and positioned on recommended surface, the firing of the power load (B) imbeds the stud to normal depth. The piston is not in contact with the buffer. The tool is lifted until buffer contacts piston (C), and a 45-deg turn of tool to right aligns buffer with piston to let tool be lifted free of driven stud. Free flight of stud is avoided when tool is loaded and positioned on surface which may allow penetration of stud (D). Stud penetrating more than ⅜ in. beyond normal depth (E) brings piston into contact with buffer, halting flight of stud. The deformed buffer can then be removed and replaced and operations continued. In addition to its safety advantages, this tool is claimed to offer quieter operation for fastening jobs with top pull-out resistance. Remington Arms Co., Inc.





ALL-PRO TEAM

THE bedrock of an engineering and construction company is the corps of key men in key positions—permanent men whose skill and knowledge have been built up through years of experience in a wide variety of jobs. Pictured here are just a few of the men who make up the permanent organization of F. H. McGraw & Company: engineers, cost accountants, construction superintendents and foremen who have handled more than a billion dollars worth of engineering and construction in the past 28 years.

In all phases of construction, from preliminary design through finished building and mechanical installation, McGraw men have compiled an impressive record of achievement for the major firms in American Industry and for Government. McGraw men and machines are tooled and ready to take on any engineering and construction assignment. We would be happy to have a McGraw engineer call to discuss your construction needs—with no obligation, of course.

MEN OF McGRAW

The professional construction men who make up the McGraw team include some who have been with the company nearly a quarter of a century, and many who have nearly 20 years' service. Included are "pros" like Field Accountant "Patty" O'Brien, a 24-year veteran; Project Manager John Galley, 11 years; Construction Foreman "Bronco" Monacchio, 22 years; Field Engineer "Jiggs" Ossenfort, 16 years; Project Engineer George Fulton, 12 years; Chief of Supply Bob Moeller, 23 years; Construction Superintendent Mike Dykun, 19 years.

These men, and others like them, are veterans of major McGraw construction achievements for such clients as Ford Motor Co., U. S. Steel, Kimberly-Clark, Union Carbide, Westinghouse, General Aniline, U. S. Rubber and other leading industrial firms.

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Engineers and Constructors to American Industry

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In MONTREAL: F. H. McGraw Company of Canada, Ltd.

For more facts circle 584 on Reply Card

NEW PRODUCTS

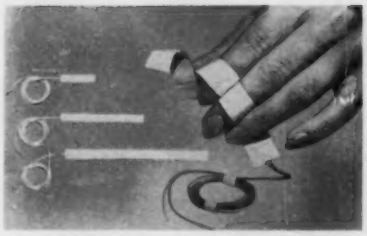
(Begins on page 172)

nesses each. They range from 0.040 to ⅛ in. for the smaller, and 1/16 to ¼ for the larger. Thinner plates are suggested where the surface is not subject to impact and where abrasion is not severe. After application, joint spaces are said to be less than 0.003 in., and maximum smoothness is achieved by grinding the surface after application. The hexagonal shape of the plates avoids straight-line joints. Kennametal Inc.

10—COOLANT HOSE with stands high temperatures

Fluoroflex-T R536 contains no metal, it is pointed out, and it combines excellent high voltage insulation, protection against corona and moisture absorption, unusual flex-life and vibration resistance. This hose is expected to answer flexible hose requirements for collant lines on large electric generators and to be of value in the production of high power transformers and similar equipment. Its suitability for these applications is enhanced by the chemical inertness of the Fluoroflex-T tube compound which, according to manufacturer, tends to make it resistant to deterioration, therefore more serviceable. Resistoflex Corp.

Use the Reader Service Cards provided on pages 237-238 to ask for more information on these products. Circle item numbers of products in which you are interested.



12—THERMAL RIBBON detects the surface temperatures

The Thermal Ribbon provides a means of electrically detecting the temperature of the surface to which it is attached. Described as extremely flexible and with negligible thermal lag, Thermal Ribbons are designed for use in electronic equipment, and other applications where it is necessary to accurately monitor or control temperatures of surface areas. The ribbon consists of a resistance element of high nickel content alloy wire encased in a flexible outer covering. Less than 0.020 in. thick, the ribbon may be cemented to flat, cylindrical, or irregular surfaces. Designed to operate over wide temperature ranges, and under severe physical conditions, the ribbons are made in several shapes and sizes. Minco Products, Inc.

13—SWING JOINT for machine tool coolant lines

For conducting coolants to the working areas of machine tools, the CPV Swing Joint will not leak, manufacturer announces, and usage improves its seal. Installation is reported simple, and little or no servicing required. These swing joints come in two types —in-line and angle—and in four sizes from ⅜ to 1 in. Bodies are of cast bronze. Combination Pump Valve Co.

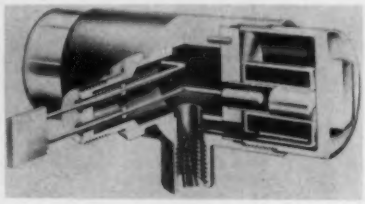
11—LIFT TRUCK for below ground level handling

This industrial lift truck with channels that lower below ground level for special handling jobs can be used for such assignments as handling in pits, lowering palletized materials into dipping or cleaning tanks, or transferring material in a varied floor-level plant. In a 6000-lb capacity model, the truck can handle loads off a level 72 in. below the floor level and raise them to a height of 41 in. above ground level. The primary lifting channels support secondary lift channels which are attached to a fork carriage at top of primary channels. Each channel assembly has its own lifting cylinder and set of controls. For operations below ground level, secondary channels with a fork carriage mounted

at bottom of mast are lowered hydraulically. Overall height is only 83 in. The Yale & Towne Mfg. Co.

14—LEVEL CONTROL for liquids, solids and slurries

Model CL-10 Dynatrol utilizes a new design principle for accurate and versatile high or low point detection or narrow range proportional control of liquid, solid and slurry levels. This small and rugged control has a positive acting electrical output control signal that varies with amount of immersion of 120-cps vibrating paddle



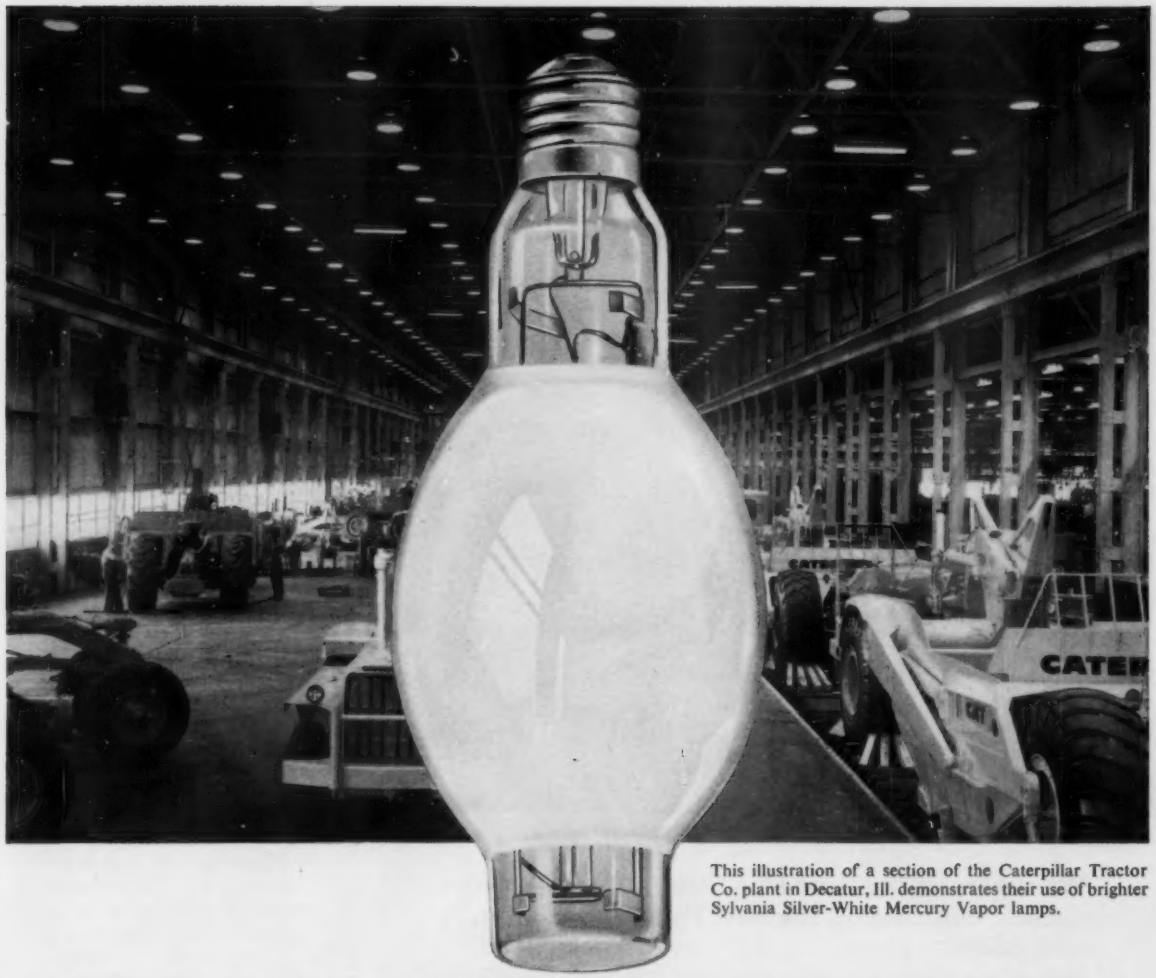
in the medium being detected. The output signal can be used to control the operation of any type of electrical equipment. Design allows transmission of vibrational energy from driver end to the sensing paddle and back to the ouptut signal end through a linkage path welded to rigid metal pressure seals at the node points where zero amplitude of vibration occurs. Unit is rated for 3000 psig pressure, explosion-proof 115 v a-c, corrosion resistant and takes any mounting position with only ¾ in. NPT pipe opening is required. Automation Products, Inc.

15—FLOOR COATING resists chemicals and wear

Resistance to caustic soda, gasoline and many chemicals is claimed for Resistox, a transparent epoxy coating. For use on either old or new concrete floors, Resistox is described as an easily-applied air-dry epon coating, furnished in ready-to-use form. Manufacturer says it produces a glossy but non-slip film that minimizes concrete dusting and promotes easier floor maintenance. Toch Brothers.

16—INSTRUMENT measures vibration, finds its cause

IRD Model 600 Vibration Analyzer is announced as providing instrumentation to 1) measure the amplitude or velocity, the frequency and the phase of vibration; 2) study separately any frequency present in a complex system; 3) pinpoint the part causing the predominant vibration, and 4) correct the cause of vibration by balancing in place, without dismantling of machinery. The analyzer measures vibration amplitude from 0.1 to 100 mils, velocity from 0.03 to 30 in.-sec, and frequency from 540 to 150,000 cpm. A continuously variable filter is incorporated to permit separate anal-



This illustration of a section of the Caterpillar Tractor Co. plant in Decatur, Ill. demonstrates their use of brighter Sylvania Silver-White Mercury Vapor lamps.

Reduce overhead costs...increase overhead light with Sylvania Silver-White Mercury Vapor lamps

Like many other leading companies, Caterpillar uses Sylvania lamps. They have installed Sylvania Mercury Vapor lighting, with its service and economy advantages for efficient high-bay lighting.

Sylvania's Silver-White lamp offers advantages never before possible in mercury vapor lighting. It's the most efficient mercury lamp ever developed for general use. The Silver-White delivers up to 20% more light than other color-improved mercury vapor lamps... yet costs no more. In addition, you enjoy color integrity that cannot be matched by any conventional color-improved mercury lamp now made.

These exclusive advantages make the Silver-White lamp a most efficient, more versatile light source for high-bay plant illumination, for outdoor industrial use, and for highway lighting.

Uniform quality and superior construction features mean extra savings, too, with Sylvania mercury lamps. Built for rugged use, they perform long after others fail from shock and vibration. They provide maximum, uniform light throughout their life . . . help increase plant efficiency and morale. And they offer the economies of a Sylvania Group Lamp Replacement program that reduces plant down time and more costly one-at-a-time lamp-changing expense.

Available in 100-, 175-, 400-, 700-, and 1000-watt types, Sylvania Silver-White lamps can give you more for your mercury vapor lighting dollar. Call your local Sylvania Supplier for the facts, or write:

SYLVANIA ELECTRIC PRODUCTS INC.
Lighting Division, Dept. 7L-7012
60 Boston Street, Salem, Mass.
In Canada: Sylvania Electric Products (Canada) Ltd.
Shell Tower Building, Montreal

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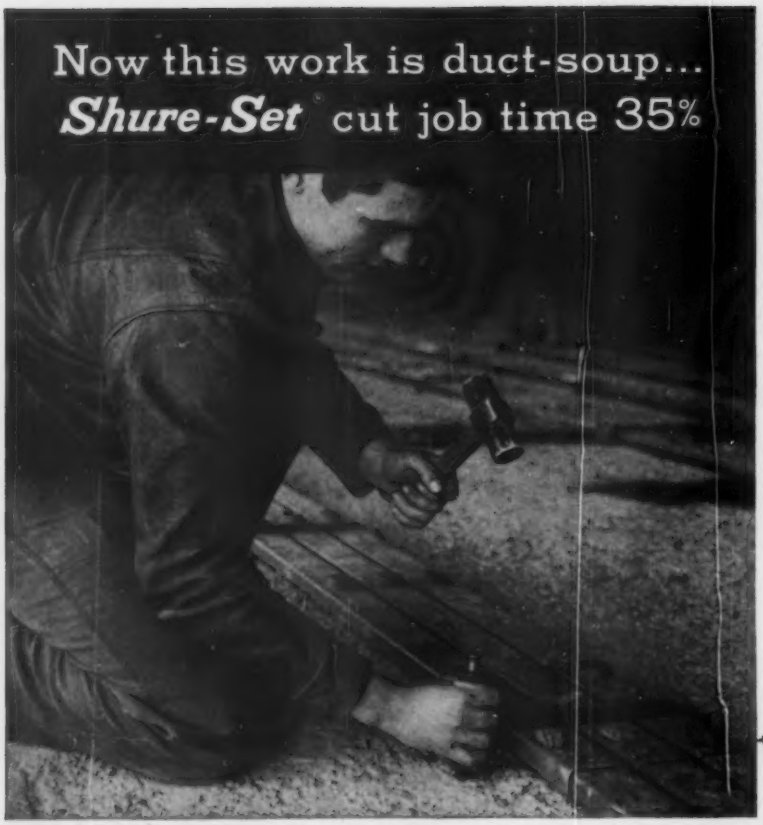

"We cut fastening time by a third on 4000 fastenings into concrete on the new Falstaff building," reports Ledbetter Electric Co. of St. Louis.

SHURE-SET does away with concrete nails that bend and shear . . . does away with expansion bolts and the tedious work of drilling and plugging. Yet SHURE-SET uses no cartridges, just hammer power . . . makes each hammer blow more effective—sends home fasteners accurately and fast! Does many jobs in 30 seconds which once took up to 15 minutes.

SHURE-SET makes fastening easier because it drives like a nail and holds like an anchor in mortar, concrete or light steel.

SHURE-SET—and its companion tool RAMSET, the powder-actuated fastening system—can save you time and money. Better investigate. Write today for free catalogs describing both SHURE-SET and RAMSET.

Companion tool—
Ramset
DUO-JOBMASTER®
(powder-actuated)
sets ¼" and ⅜" fasteners interchangeably

Shure-Set
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PATENTS PENDING
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Ramset Fastening System
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OLIN MATHIESON CHEMICAL CORPORATION

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For more facts circle 586 on Reply Card

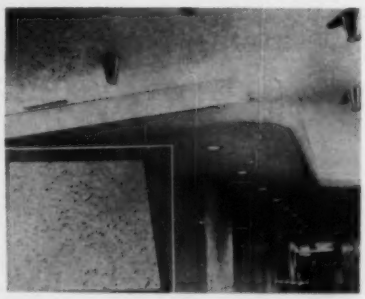
NEW PRODUCTS

(Begins on page 172)

ysis of each frequency. Other components include a velocity type vibration pickup and a stroboscopic lamp. The instrument is housed in a case with carrying handle. International Research & Development Corp.

17—ACOUSTICAL TILE is non-combustible, fissured

Styltone is announced as a non-combustible, mineral acoustical tile, random fissured, so that installed material absorbs sound and provides a beautiful appearance. With surface fissures act-



ing as highly effective sound traps, styltone is reported to have noise reduction coefficients of .65-.75 and .75-.85, depending upon type of mounting. Finished with a non-bridging, flat, acoustical, white paint, it has an "a" light reflectance. Styltone is not subject to damage by rot, decay, fungus, mold or termites, it is pointed out. It comes in ¾ in. thickness in sizes 12 by 12 in. and 12 by 24 in. with either bevelled or square edges, kerfed and/or rabbeted where necessary for mechanical suspension. Acoustical Div., Baldwin-Hill Co.

18—ENCLOSURE for plug-in type circuit breakers

Now available for this manufacturer's two- and three-pole plug-in Type TQL circuit breakers is a compact, "handle through cover" enclosure. With 240-v a-c, 10 through 50 amp two- and three-pole breakers, the device can be used for individual or centralized control of equipment. It can be used as a main disconnect for remotely located branch circuit panels and to protect insulated conductors in feeder and branch circuits from overcurrent. These enclosures are furnished for flush or surface mounting in a light gray Bonderized finish and are said to offer advantages normally found only in larger enclosures. They feature insulated groundable neutrals, spacious wiring gutters, ample knockouts, and a

LYON quality design is reflected in this new handle with beautifully contoured lines, finger-tip action and finished in durable chrome.

"LYON QUALITY DESIGN *makes* THE DIFFERENCE!"

STEEL LOCKERS, for example. Look for the design features that pay off for years and years. Compare Lyon construction and you'll see how and why you get so much more in both durability and appearance.

This same quality design makes the difference in every one of the more than 1500 standard Lyon items, a few of which are shown below.

CALL YOUR LYON DEALER. He offers the world's most diversified line of steel equipment. Equally important, he can show you how to get the most for your money in terms of saved time and space.

We can manufacture special items to your specifications.

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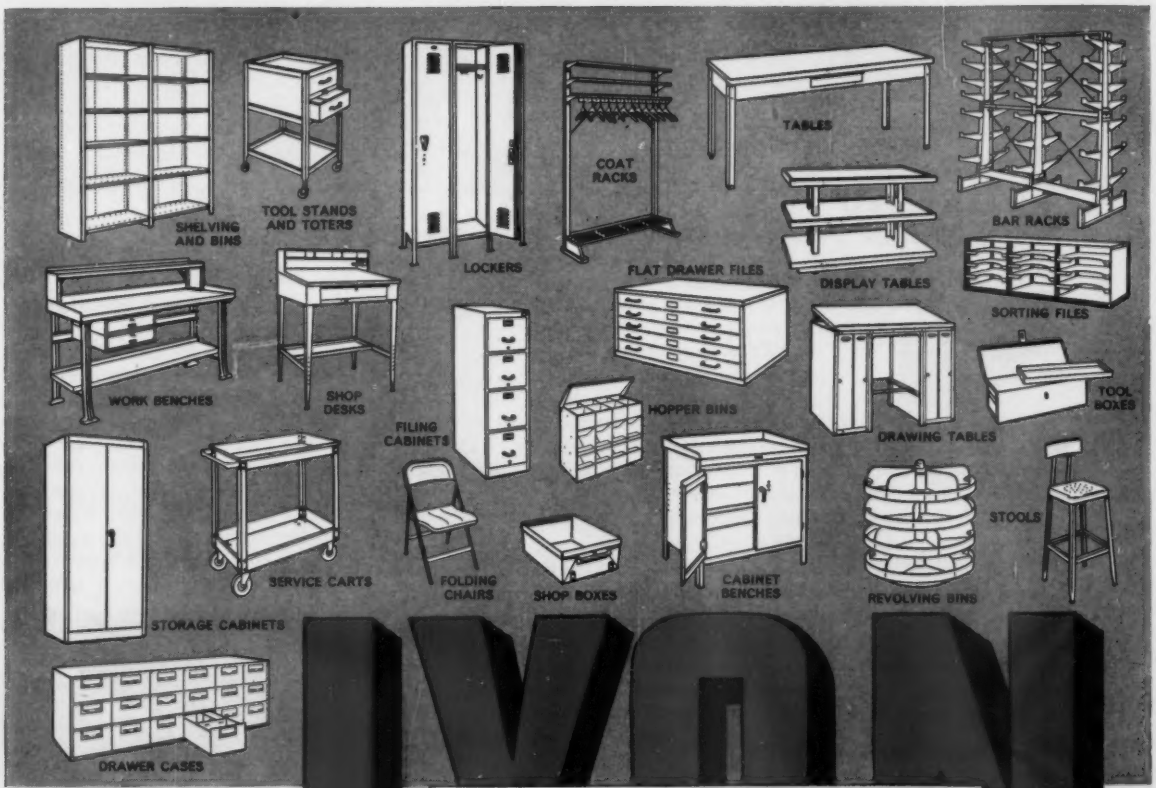
Factories in Aurora, Ill. and York, Pa.
Dealers and Branches in All Principal Cities



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for Business, Industry, Institutions

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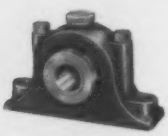
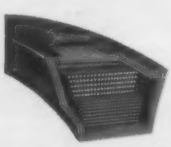
FLEXIDYNE
THE DRY FLUID DRIVE
100% efficiency at full load!



DODGE-TIMKEN
America's Quality Pillow Blocks!



SEALED-LIFE V-BELTS
The life is sealed in!

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- Roller Bearings. Load ratings, dimensions, etc. Bulletin A-638.
- Sealed-Life V-Belts. Complete data and sizes. Bulletin A-606-A.

DODGE MANUFACTURING CORPORATION
2700 Union Street • Mishawaka, Indiana

DODGE
of Mishawaka, Ind.

For more facts circle 588 on Reply Card

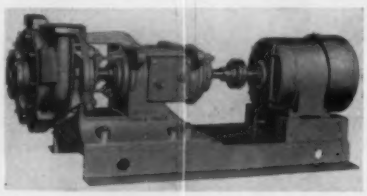
NEW PRODUCTS

(Begins on page 172)

padlock locking shelf designed to prevent unauthorized operation of the handle. General Electric Co.

19—PUMPS offer operational advantages

The H series of single stage, end suction, centrifugal pumps, are available in three types of water-ends: Type HR (shown) for handling abrasive mixtures where head is limited; Type HC with split bearing stand for corrosive applications; and Type HF for either abrasive or corrosive applications where high pressures are developed. The water-end or casing can be rotated to any one of four positions to



provide discharge of pumped material in any of four directions.

Several advantages are stressed by manufacturer, first, that oil or grease lubrication is optional. Also, these pumps have a simple, readily accessible arrangement which provides radial adjustment of the shaft to assure concentricity of the shaft through the stuffing box. All assemblies are made by bolts and nuts—there are no tapped holes. If nuts cannot be readily loosened, they can be burned off with a torch, it is pointed out, and without damage to the pump. Slippage seal adjustment is handled with a common wrench. All models in the H series are available in sizes from 1 to 16 in. for heads in some cases up to 250 ft or more and capacities to 10,000 gpm. Nagle Pumps, Inc.

20—MOTOR OPERATOR is oil-submerged, proportional

This oil-submerged, spring return, proportional type electric motor-operator is designed to control dampers in heating, ventilating and air conditioning systems, and in other industrial applications. Mounted in any position, motor features a gear train and drive submerged in oil and sealed in a die-cast. Auxiliary switches are readily accessible and adjustable. The output shaft is power operated in both directions to position a controlled device as required when power is on, company notes, and it maintains this position with an internal holding circuit. Enclosed spring return drives controlled device to its normal position on a power interruption. Motor operator is available in 24, 115, 208 and 230 v. Barber-Colman Co.

21—PORTABLE BENDER for ¾-in. rigid steel conduit

Newest of this manufacturer's Powr Jack line, the Model PJ100 Redege Benfield Bender is designed to bend ¾-in. Sherarduct and other types of rigid steel conduit, as well as 1-in. Xduct Junior metallic tubing. This one-piece bending tool utilizes a two-position foot treadle booster step to provide a means of constant, heavy foot leverage for smooth radius bends. Other features include an integral back pusher to true up and straighten bends, and á safety collar for handle thread protection. The bender is announced as competitively priced. National Electric Products Corp.

22—CLEANING SOLVENT for greasy machine parts,

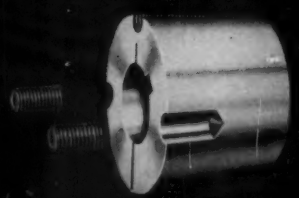
This pleasantly scented safety cleaning solvent is introduced for wipe or dip cleaning of greasy and oily machine parts and electrical equipment. According to manufacturer, the cleaner replaces carbon tetrachloride and other chlorinated solvents and has no flash point under normal usage. It is reported to compare in toxicity to Stoddard Solvent and offer advantage of high solvent power with rapid evaporation. Harco Chemical Co.

23—NON-SEGREGATED-PHASE BUS is sealed, insulated

This 4.16-, 7.2- and 13.8-kv 1200- to 3000-amp non-segregated phase bus is sealed with cork Neoprene-gasketed split half round covers and insulated by air and porcelain insulators, no organic materials are used for insulation, according to manufacturer. It is claimed ideally suited for generator leads to transformers, for connecting transformers to switchgear assemblies, for inter-connecting switchgear assemblies, and for distribution of light and

IT'S **TAPER-LOCK**

—IT'S INTERCHANGEABLE!



TAPER-LOCK SHEAVES

TAPER-LOCK SPROCKETS

TAPER-LOCK COUPLINGS
Rigid—Flexible—Chain

TAPER-LOCK STEEL CONVEYOR PULLEYS

The New Way to Cut Costs

Save time in mounting. Cut down-time on production machines. Standardize with Taper-Lock, the *interchangeable* bushing. The same Taper-Lock bushing fits sheaves, sprockets, couplings, conveyor pulleys. That means smaller inventories of power transmission parts. And it means quicker changes when necessary to keep production lines running!

Taper-Lock bushings are available in a range of sizes which makes it easy to change from one size shaft to another. Taper-Lock products slip onto the shaft quickly — hold with the firmness of a shrunk-on fit—come off easily, without shock to bearings or machinery. You'll profit by standardizing on Taper-Lock.

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CALL THE TRANSMISSIONEER, your local Dodge Distributor. Factory trained by Dodge, he can give you valuable assistance on new methods. Look for his name under "Power Transmission Machinery" in the yellow pages of your classified telephone directory — or write us.

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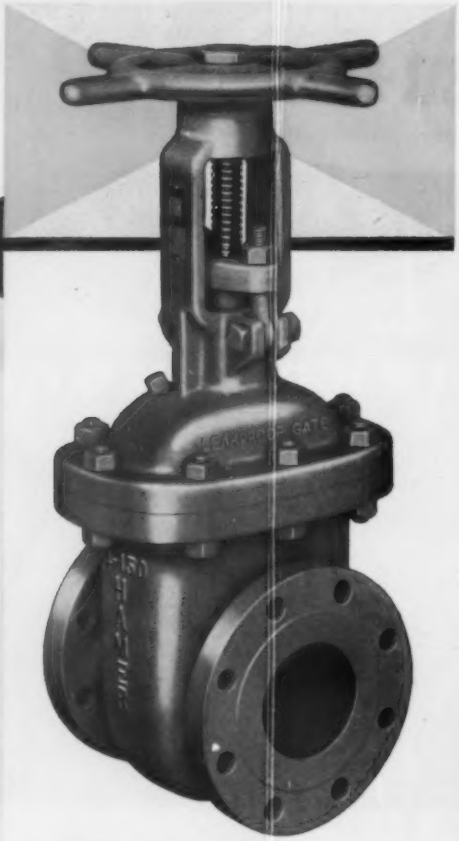
Introducing the new

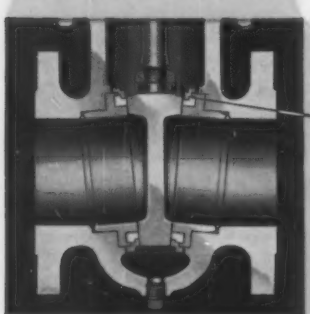
HAMER
Leakproof
GATE
VALVE



Impenetrable Shut-off Upstream —Downstream

This new Hamer Gate Valve incorporates a double sealing action design that's both absolute and foolproof. In addition to the precision metal to metal fit of the wedge, the Hamer Gate Valve incorporates two Teflon* seal rings which compress dead tight against the wedge. Thoroughly proven under the most rugged field condition tests, the Hamer Gate Valve with its positive shut-off both upstream and downstream, eliminates the need for a double block and bleed in piping installations.

Hamer Gate Valves incorporate a new high standard of valve production. Stainless steel valve seats are welded-in for accurate fit. Locking rings are of corrosion resistant stainless steel. And precision finish on critical parts assure a smooth operating valve even after years of hard service. Write today for literature. See for yourself why Hamer Gate Valves are truly a valve without equal.



Double Sealing Action forms Impassable Shut-off

TEFLON SEAL RINGS... Renown for their inert characteristics, these Teflon seal rings have amazing durability even under the most adverse of service conditions.

PRECISION FINISHED GUIDES... Wedge guides are machined to exacting tolerances. Eliminates chatter and wear caused by line pulsations, accurately centralizes the wedge between the seats.

*RTM DUPONT

Send for Gate Valve Catalog ▶

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P. O. Box 1851
2919 Gardenia Ave., Long Beach 1, Calif.
Representatives throughout the World

For more facts circle 590 on Reply Card

NEW PRODUCTS

(Begins on page 172)

power in industrial and office buildings. Other features announced include flexible or laminated connectors to make sections easier to install. The circular design requires less space for installation and is for indoor or outdoor use. I-T-E Circuit Breaker Co.

One of these products may be "just what you're looking for." Use the handy Reader Service Cards to ask for more information on it.

24—ARMORED CABLE may be used without conduit

Interlocked armored cable provides advantages of high resistance to harmful chemical action and easier installation and maintenance, it is announced, and because of its protective metallic covering the cable may be used without conduit. Cable is available in 600-, 5000- and 15,000-v ratings with a

galvanized steel, aluminum, or bronze covering. Internally, the cable may be used for power and lighting, motor, control or overhead circuits. Compared with cable-in-conduit, interlocked armored cable is claimed to require less space and be easier to install because of its flexibility. Troughs, racks or ladders are used instead of conduit. According to company, this open system affords greater versatility and more efficient maintenance. Internal wiring rearrangement or additional power facilities may be added without major building alterations. System may be installed vertically or horizontally. Rome Cable Corp.

25—BALL BEARING GREASE stands high temperature

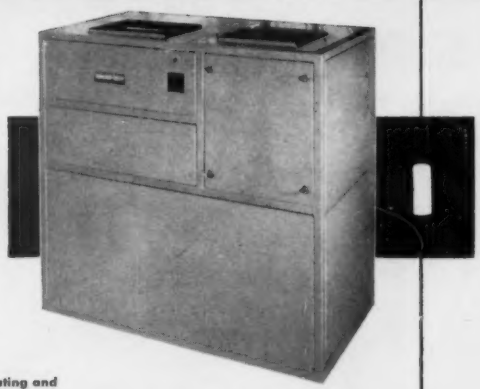
Belex Grease is a multi-purpose ball and roller bearing grease containing an inhibitor designed to improve its resistance to oxidation and corrosion. According to company, the grease has low starting and running torque, good metal adhesion, ability to withstand

Your Choice of

PACKAGED AIR CONDITIONERS
easy to select...simple to install

Dunham-Bush CPU Commercial Package Units

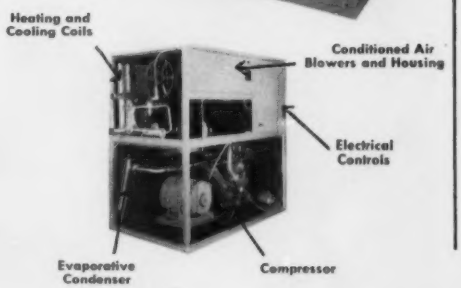
ONE PACKAGE "PRE-ENGINEERED" AIR CONDITIONING SYSTEMS 10, 15, 20, 30 & 40 TON MODELS



This pre-engineered Dunham-Bush unit is a complete air conditioning *system* housed in one cabinet. Each unit is *entirely self-contained* . . . with evaporator, compressor, evaporative condenser and pump, fans, motors, piping and controls . . . all *pre-engineered* to provide peak operating performance at minimum operating cost.

'CPU' Units feature patented high efficiency Inner-Fin cooling coils; compressors specially selected for quiet operation; and forced-draft, blow-through type Inner-Fin evaporative condensers. Installation requires only power, water and duct connections.

Write for complete specifications



Brunner Division Dunham-Bush Packaged Air Conditioners

3, 5, 7-1/2 & 10 TON MODELS

Available in four models, each designed for use with duct work or with separate discharge plenum for in-room cooling.

The 3 H.P. model features the Brunner-Metic semi-hermetic condensing unit: other models feature the ruggedly dependable Brunner open-type condensing units. All models are compact, self-contained floor type units . . . attractively finished in hammertone green.

Units are shipped ready to operate . . . require only electrical and water connections.

Write for complete specifications

Dunham-Bush, Inc.

WEST HARTFORD 10 • CONNECTICUT • U. S. A.

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AIR CONDITIONING • REFRIGERATION • HEATING • HEAT TRANSFER

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where proper maintenance can mean LIFE or DEATH...

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PORTABLE VACUUM CLEANERS

In building jet planes, thorough maintenance procedures are more than just good housekeeping. They're *absolutely vital* to protect pilot and plane from possible disaster.

If not removed, a stray nut, bolt or rivet can work its way into the air intake duct . . . be sucked into the engine . . . damage the turbine blades and cause the plane to flame-out in flight.

That's why, here at Republic Aviation, fuselages and wing sections of F-84 Thunderstreaks are SPENCER *vacuum-cleaned* to remove all stray metal.

Whether or not maintenance is a matter of life and death with you, it will pay to check on rugged, reliable SPENCER vacuum cleaners.

REQUEST CATALOG NO. 155B

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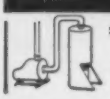
OTHER QUALITY SPENCER PRODUCTS



STATIONARY VACUUM SYSTEMS

PORTABLE VACUUM CLEANERS

PNEUMATIC CONVEYING SYSTEMS

For more facts circle 592 on Reply Card

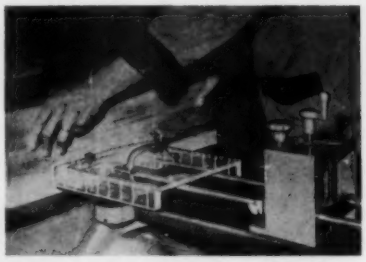
NEW PRODUCTS

(Begins on page 172)

high temperatures and good mechanical stability. It is reported completely stable under all service and storage conditions, impervious to water, and its tough grease film will last longer under normal conditions. The grease can be used for plain type bearings as well as in anti-friction bearings. Bel-Ray Co., Inc.

26—JOINTER GUARD for safety, versatility too

The Vu-Jointer features a standard of cast aluminum with a shield of Plexiglas ½ in. thick. The shatter-resistant, transparent shield covers the jointer's rotating blades without obscuring them from view. The Vu-Jointer also functions as a work-speeding guide. The



new tool is announced as readily adaptable to any conventional jointer, 4- to 12-in. blade size, without adjustments or disassembling. It is designed to perform in a wide variety of operations including regular jointing cuts, chamferred edges, bevels and vertical rabbets (even from a flat position for larger cuts). A feature of the Vu-Jointer is interchangeability with company's standard Brett-Guard for circular table saws, accomplished by the addition of a steel mounting plate. The Brett Guard Co.

27—PACKAGED DRIVES for adjustable speed control

Speed Variators come in ratings of 3 through 150 hp and in speed ranges of 8 to 1 and higher. These packaged adjustable speed drives are designed for use on continuous processing lines, calender drives, machine tools, crane hoists, metal rolling mills and wherever adjustable speed for fine control is needed. Company's Amplistat regulator with silicon rectifiers is standard on the line, and is designed to provide smooth, timed acceleration and deceleration to preset speeds in addition to voltage regulation. The static excitation system with silicon rectifier has no moving parts and needs no warm-up period. The motor-generator

For more facts circle 593 on Reply Card →

Cumberland Plant, Pittsburgh Plate Glass Company
Designed by Lockwood-Greene, Engineers, New York, N. Y.

Where next?

Completion of 10,199-ton job means only the beginning of another to veteran American Bridge superintendent!

THIS man represents one of the vital advantages you get when American Bridge erects your buildings.

He is "Liz" Evelsizer, American Bridge erecting superintendent. Veteran of 25 years of erecting steel, and superintendent of many major projects, he has just finished erecting Pittsburgh Plate Glass Company's tremendous new plant near Cumberland, Maryland—10,199 tons of structural steel without a major hitch. (Not to mention the installation of thousands of tons of plant machinery and overhead cranes.)

"Liz" Evelsizer is a typical American Bridge erecting superintendent. With such great projects as Buick's Flint Plant (1952), Continental Can's Pittsburgh Plant (1953), and General Electric's Louisville Works (1955) behind him, and with as fine an erecting crew as you'll find anywhere working for him, it's obvious why the apparently ticklish task of putting up structures soundly, speedily and safely has long since been a habit with him.

And, as we said, "Liz" Evelsizer is a typical American Bridge erecting superintendent. They all have broad experience in the most demanding kinds of structural steel work, justifying their casual confidence that there isn't a structure that they can't handle in stride.

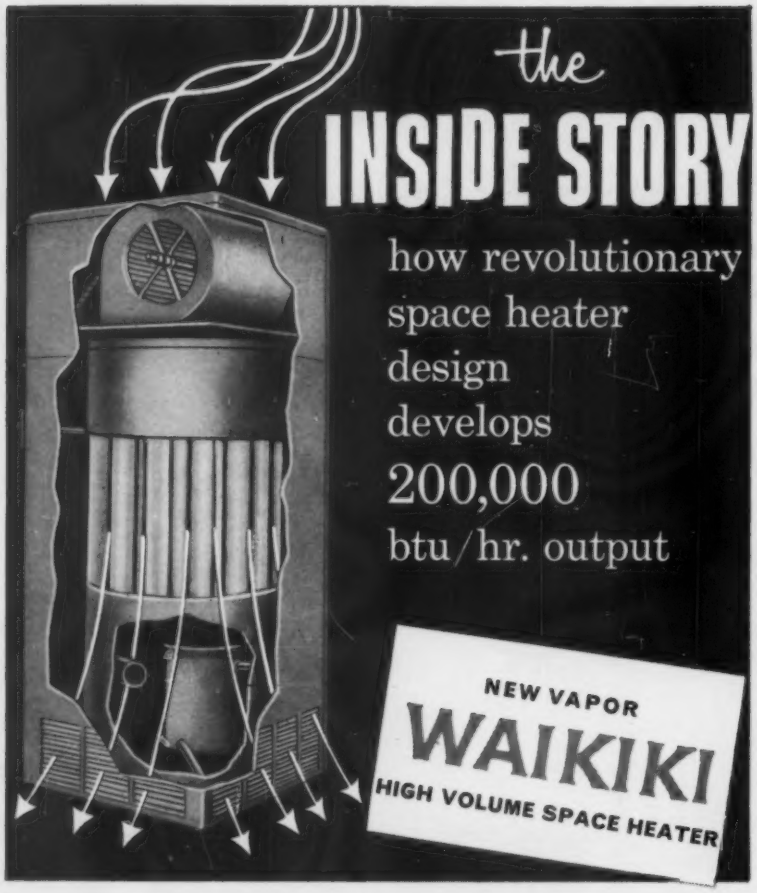
So it is the combination of experienced men like "Liz" Evelsizer working with steel, the finest construction material available—steel that has been precision fabricated by equally experienced men—that assures you of a first-rate job from American Bridge every time.

AMERICAN BRIDGE DIVISION, UNITED STATES STEEL CORPORATION, GENERAL OFFICES: 525 WILLIAM PENN PLACE, PITTSBURGH, PA.
Contracting Offices in: Ambridge · Atlanta · Baltimore · Birmingham · Boston · Chicago · Cincinnati · Cleveland · Dallas · Denver · Detroit · Elmira Gary · Houston · Los Angeles · Memphis · Minneapolis · New York · Orange, Texas · Philadelphia · Pittsburgh · Portland, Ore. · Roanoke St. Louis · San Francisco · Trenton · United States Steel Export Company, New York

AMERICAN BRIDGE

USS

UNITED STATES STEEL



Imagine—this compact 6½ ft. high, 30 in. square space heater produces enough heat to comfortize three 5-room homes! Extra-large heat transfer area (1 sq. ft. for each 3500 b.t.u. of rated output) and high volume *counterflow* air circulation does it. The result: abundant, uniform floor-to-ceiling, thermostatically controlled heat for "spot" or overall distribution—*when* and *where* you want it—with impressive fuel savings.

Installs vertically or horizontally on floor, shelf or balcony—for direct or duct distribution.

VOLUME HEAT WITH TOP ECONOMY

. . . for physical comfort in shops, warehouses, garages; for curing and drying; for thawing and defrosting; for pre-heating.

Burns Kerosene, Fuel Oils Nos. 1 and 2, Gas (Natural, Manufactured, L-P).

Send for Full Facts Today

VAPOR HEATING CORPORATION
80 East Jackson Blvd., Chicago 4, Illinois, Dept. 18-L

Please send New Waikiki Bulletin No. 445A.

Individual_____
Title_____
Company_____
Street_____
City, Zone, State_____

For more facts circle 594 on Reply Card

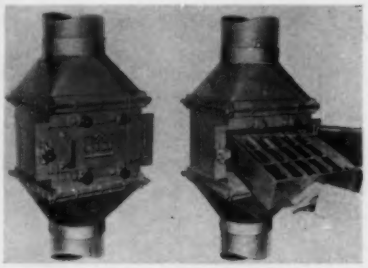
NEW PRODUCTS

(Begins on page 172)

set is of two-unit, four-bearing design, in which company's Tri-Clad 55 a-c motor and d-c generator are connected by flexible coupling. Standardized power unit control devices are unit-mounted and front connected. Smaller and lighter, the units can be installed end-to-end, end-to-wall or within 6 in. of back wall. General Electric Co.

28—MAGNETIC GRATES offer simplified installation

Designed as a packaged unit for easy installation in vertical gravity flow lines, this permanent magnetic grate separator is available in models adapted for either tramp or fine iron removal, whichever constitutes the



major problem in a specific application. Grates and housing are incorporated in a single package, ready for mounting in a simple opening. A hinged and gasketed door front encloses and holds the double-banked magnetic grates within the housing, making them readily accessible for periodic removal of iron accumulations. The unit designed for separation of fine iron particles differs from the tramp iron separator in having a closer spacing of Alnico V magnetic tubes, placed so as to afford maximum efficiency in attracting and holding fine contaminants. Eriez Mfg. Co.

29—PIPE SQUEEZER for simplified gas line repairs

The Flow-Stop Pipe Squeezer consists of a hydraulically operated ram and a pair of jaws that clamp around the pipe. Pressure of the ram against the jaws compresses the pipe until the flow is shut off. The Flow-Stop Pipe Squeeze is suggested for relocating service lines and mains, and repairing leaky and ruptured lines and mains. In these operations, the squeezer is placed on the upstream side of the line, with pressure applied until flow is stopped. The line is then repaired, and the squeezer used as an opener by placing it over the pipe at a right angle

A Bronze yoke bushing nut
B Handy grip iron wheel
C Bronze yoke bushing
D Iron yoke cap with zerk fitting for lubricating bushing
E Steel yoke cap bolts and nuts
F TYPE 316 STAINLESS STEEL spindle
G NI-RESIST CAST IRON, TYPE 2, yoke
H Bronze eye bolt nuts
I Malleable iron gland flange
J Steel gland eye bolts
K Steel gland lug bolts and nuts
L TYPE 316 STAINLESS STEEL gland
M Teflon impregnated asbestos packing
N TYPE 316 STAINLESS STEEL bonnet bushing
O NI-RESIST CAST IRON, TYPE 2, bonnet
P Steel bonnet bolts and nuts
Q TYPE 316 STAINLESS STEEL spindle ring
R Asbestos gasket
S TYPE 316 STAINLESS STEEL wedge pin
T NI-RESIST CAST IRON, TYPE 2, through-port body
U TYPE 316 STAINLESS STEEL solid I-beam wedge
V TYPE 316 STAINLESS STEEL seat rings

Wherever valves are attacked by acids, salt and alkaline solutions, sea water, brine or other corrosive fluids, vapors or gases, "Jenkins Ni-Resist Gate Valves" are *fighting* words.

In a wide range of corrosive and erosive services common to the chemical, food, plastics, marine, petroleum, and pulp and paper industries, these valves have shown a remarkable ability to withstand corrosion and cut valve costs.

The secret of their long, trouble-free service is the combination of Ni-Resist type 2 cast iron and type 316 stainless steel trim, plus Jenkins *extra value* construction throughout. No other gate valves offer this combination for fighting corrosion.

When choosing Ni-Resist valves, let the famous Jenkins Diamond be your guide. Specify "JENKINS NI-RESIST" — for longer valve life. Write us, or ask your Jenkins Distributor for information folder No. 205. Jenkins Bros., 100 Park Avenue, New York 17.

JENKINS
LOOK FOR THE JENKINS DIAMOND
VALVES
JENKINS
SINCE 1864
Jenkins Bros.

Sold Through Leading Distributors Everywhere

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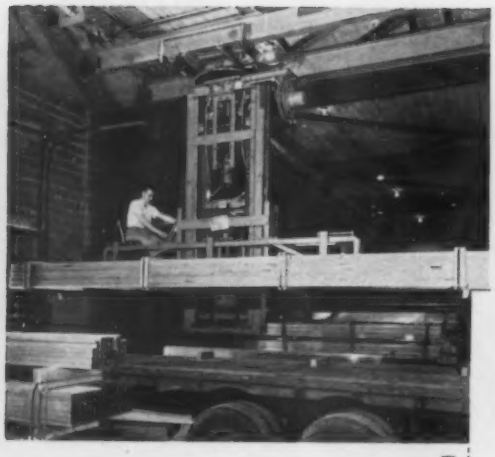
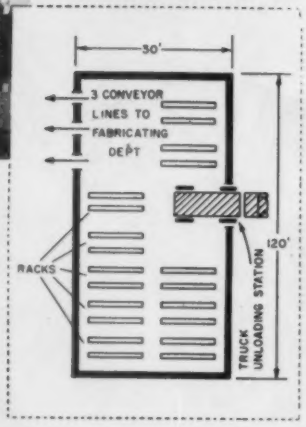


1 MAN ...and TRAK-RAK



handle complete warehousing operation

UNLOADS TRUCKS, STORES MATERIAL IN 1 OPERATION

When the Per-Fit Products Corp., Indianapolis manufacturer of aluminum windows installed a Chicago Tramrail TRAK-RAK unit in its warehouse, it gained 4 big advantages:

1. **Increased the capacity of existing storage area.**
2. **Reduced handling costs by permitting 1 man to handle the entire warehouse.**
3. **Kept production lines supplied with on-time material deliveries.**
4. **Handled high grade aluminum extrusions without damage.**

The TRAK-RAK unit installed at Per-Fit consists of a 1 Ton capacity underrunning crane from which is suspended an electrically operated rotating telescoping column which is fitted with a three-fork carriage. All operations of the TRAK-RAK unit are controlled by the operator, who rides with the carriage. The unit serves a series of self-standing racks equipped with arms which receive the bundled material. Because the TRAK-RAK column requires minimum operating space, the aisles between racks are very narrow.

Trucks delivering material are unloaded (top picture) by the unit, which moves over the tops of the racks (below) to the proper rack and deposits its load in 1 operation. When a particular bundle is required by production, the operator moves to the rack, picks up the bundle, and, moving overhead, travels to the conveyor lines (drawing) and sets the bundle down on the designated conveyor line.

TRAK-RAK Systems of vertical storage and handling are saving time and money in warehouses and production plants of all types. *For complete details on how TRAK-RAK can help solve your problems, write:*

CHICAGO TRAMRAIL CORPORATION

1324 S. Kostner Avenue • Chicago 23, Illinois

For more facts circle 596 on Reply Card

NEW PRODUCTS

(Begins on page 172)

to the edge of the pinch. On ruptured lines, the damaged portion is cut out and new pipe welded in place before re-opening.

Other uses of the tool are to speed trenching operations and to shut off service to buildings threatened by fire when valves are inaccessible, to close service lines on buildings to be demolished, and to use as a line-up clamp in welding pipe. There are two models. Model 5024, for use on cold nominal pipe up to 2½ in., and copper pipe to 3 in. OD, operates at pressures to 7500 psi. Model 5045 is for use on heated nominal steel pipe up to 2 in., copper pipe to 2½ in. OD and operates at pressures to 5000 psi. Regent Jack Mfg. Co. Inc.

30—STEP LADDERS designed for maximum durability

These ladders, the Underwriter (left), the Electric (center), and the Samson, are designed to provide maximum durability and longer ladder life, according to manufacturer. All three

feature flush steps to minimize chances of breakage in handling or transport. For added strength, the Samson offers new bar-type back construction. This ladder is available in 3- to 10-ft sizes. The Underwriter has wider, stronger, 3½ in. side rails, and comes in 3- to 20-ft sizes. The Electric is available in 3- to 12-ft sizes. The Patent Scaffolding Co., Inc.

31—CORROSION INHIBITOR for closed system use

Triethylammonium Phosphate 802 is announced as a highly effective corrosion inhibitor at low concentration and is suggested as an additive in closed systems where water, glycerine, alcohol, or glycol are used and where corrosion is a problem. It is a yellowish viscous liquid, soluble in water, alcohol, glycols and glycerines and is reported of particular interest as an ingredient of formulations where these coolants in combinations with other materials are stored in tin-plated and steel containers where longer storage life is desirable, or as an ingredient of water soluble corrosion inhibitors, specialty detergents, emulsion

Other Fluoroflex®-T Products

Laminated Dip Pipe: shatter and corrosion proof— withstands 500°F

A specially laminated construction gives this Fluoroflex-T Dip Pipe the strength and chemical inertness needed for the most severe applications.

Among the particularly desirable features of this dip pipe are its resiliency and light weight. Unlike those made from other materials, Fluoroflex-T Dip Pipe is fracture proof and immune to thermal shock. It cannot possibly damage glass lined and other types of expensive reactors.

Available in standard 2" to 3" ID. Special sizes to 6" ID fabricated. Send for data.

CAUTION: Because the properties of Teflon products can be varied widely by the fabricating methods employed, the fabricator's experience and integrity remain the user's best assurance of quality and performance.

The least expensive hose is the one you don't keep replacing

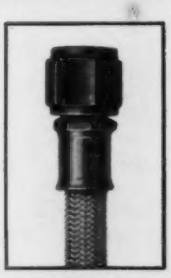
Here are three lengths of hose. Take the one on the far right. Subjected to hot oils at high temperatures – it soon deteriorates and fails. Result: time out for maintenance – and a requisition for a new hose.

Now consider the hose in the center. Installed on a severe flexing application . . . it readily fatigues and fails. Result: time out for maintenance – and a requisition for a new hose.

How often does this happen? Often enough to prove that "the *least* expensive hose is the one you don't keep replacing."

While Fluoroflex-T hose (on the far left) costs more initially, its performance actually results in real savings. Costly down-time, excessive maintenance (often at premium rates), product spoilage, interrupted production schedules, disappointed customers – all these are eliminated by Fluoroflex-T assemblies.

With its chemically inert patented tube and its blow-off proof fittings, Fluoroflex-T assemblies are ideally suited for conveying the most corrosive fluids – safely and economically. Write for data.



Most flexible hose problems are quickly solved for good with Fluoroflex-T hose assemblies – as proved by over three years of continuous service on the toughest applications in aircraft, missiles, rockets, and nuclear energy. Consider these qualifications: non-aging, completely inert chemically and flexible over range of —100°F to +500°F, exceptional flex life, lightweight, small O.D., 1000 psi pressures.

® Fluoroflex is a Resistoflex trademark, reg. U.S. Pat. off. ® Teflon is a DuPont trademark.

Originators of high temperature fluorocarbon hose assemblies

Resistoflex
CORPORATION

Roseland, New Jersey • Western Plant: Burbank, Calif. • Southwestern Plant: Dallas, Tex.

For more facts circle 597 on Reply Card

Before you buy any boiler compare quoted prices with REAL COSTS

New Cleaver-Brooks cost analyzer clears "quotation" confusion — reveals ALL costs

Get *all* the costs . . . the *real* costs . . . down on paper before you recommend or specify a boiler to your clients. On many boiler installations "quoted prices" seldom agree with the total costs, as you may have learned. This is frequently the case with so-called "built-up" boilers assembled on the site.

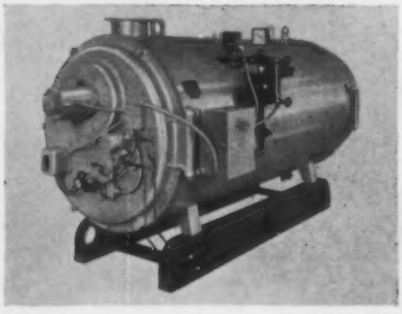
Cleaver-Brooks' cost analysis enables you to compare all material costs (boiler, steam trim, burner, refractory, controls and other equipment) and installation labor costs. You'll know the "real costs" on the complete installation before you start.

Real eye-opener

The figures you'll see may be startling. In most cases the cost analysis proves a Cleaver-Brooks costs *less*. On-job time is drastically reduced because Cleaver-Brooks packaged units are fully assembled, ready to install. Cleaver-Brooks boilers give you more in performance, too . . . each boiler is fully fire-tested at the factory under load, tuned to peak economy. Starting service and on-the-job operator training by authorized field engineers further decreases your over-all costs.

Contact your Cleaver-Brooks agent

Once you add up all the benefits of a Cleaver-Brooks "one-cost" package . . . the proved trouble-free economy of exclusive four-pass, forced-draft design, you'll find it pays over and over to analyze costs carefully before you buy. See your Cleaver-Brooks agent for details or write Cleaver-Brooks Company, 364 East Keefe Avenue, Milwaukee 12, Wisconsin, Dept. P.



Choose from 19 sizes, 130 models, 15 to 600 hp. Oil, gas and combination oil/gas fired — steam or hot water for heating or processing.

Cleaver Brooks

ORIGINATORS OF SELF-CONTAINED BOILERS

For more facts circle 598 on Reply Card

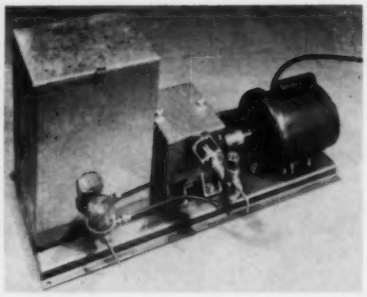
NEW PRODUCTS

(Begins on page 172)

paints, and paint removers. Hot water systems and industrial cooling systems are among suggested applications. Beacon Chemical Industries, Inc.

32—INJECTOR PUMP feeds metered chemicals

Chemical Injector Pump Model SAC-4000 is designed to inject measured amounts of liquid chemicals into flow lines and pressure vessels, against pressures to 1200 lb. The pump is operated by a ¼-hp 1750-rpm electric motor, the 50 to 1 reduction worm gear assembly operates the cross head drive mechanism to move the piston



injectors. There may be one or two piston injector assemblies on each pump, each piston may inject measured amounts of a separate chemical at the same time. Output may be preset to inject from a few ounces to 40 gal in a 24 hr period, with one injector head, by regulating the length of piston stroke and by piston size.

The pumps are available with three standard size piston-injector head assemblies: ¼-in. piston pumps against 1200 lb pressure; ⅜-in. against 500 lb; and ½-in. against 250 lb. Each piston has a separate calibrated stroke adjustment which may be locked in position. By using variable speed motors and times the discharge output may be further regulated. Explosion proof motors, air-gas turbines or light duty gasoline engine may also be used to drive the pumps. Pistons and check valve assemblies are stainless steel, pump head body castings are Meehanite, and the chevron packing is compounded rubber. Special injector heads may be of stainless steel, bronze or plastic. Texsteam Corp.

33—COOLING TOWERS in 80- and 100-ton capacities

Twin fans are featured in these 80- and 100-ton cooling towers, announced as extra quiet in operation. Making use of large diameter, four-bladed

NOW, From General Electric . . .

A MAJOR INNOVATION IN SWITCH AND FUSE EQUIPMENT DESIGN

General Electric's new load-break Rollout Switch and Fuse equipment—available in 2.4, 4.8, 7.2, and 13.8 kv and with a high momentary rating—provides maximum safety for your personnel, plant, and equipment.

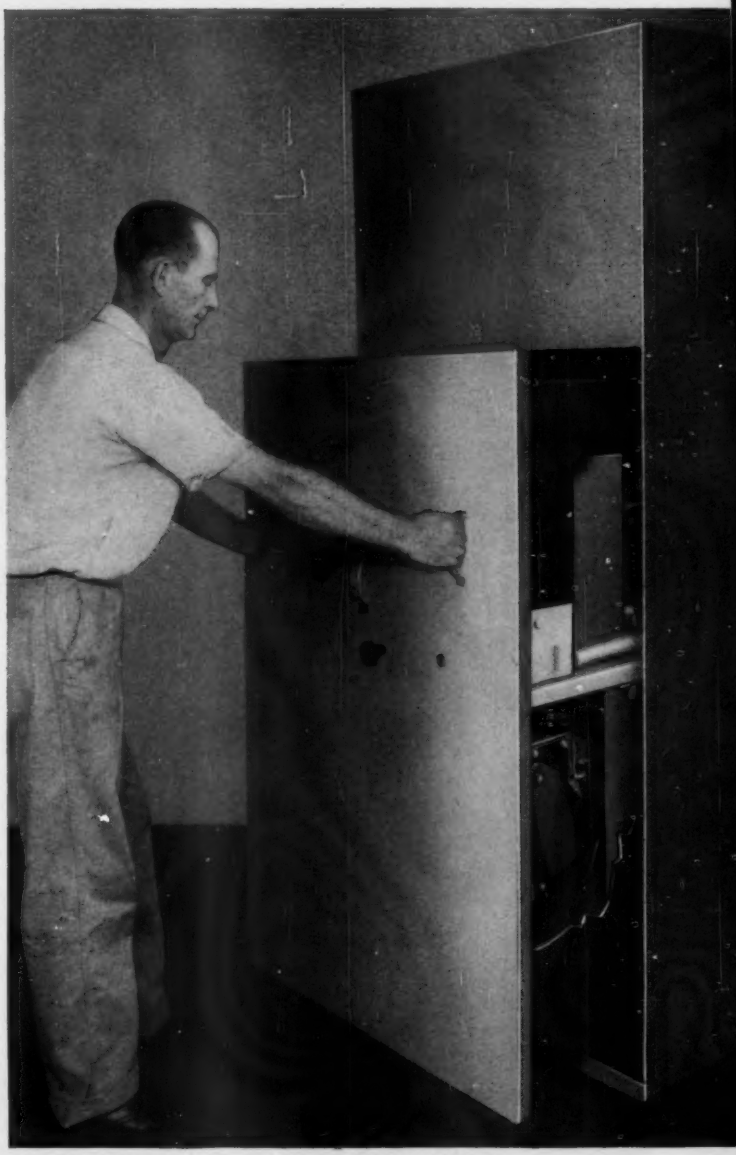
SAFER BETTER CLOSING against full momentary current is provided with the new General Electric equipment by a stored energy closing mechanism.

MAXIMUM SAFETY for inspection and maintenance is provided by the rollout feature of the new General Electric equipment.

MAXIMUM PROTECTION is built into General Electric's equipment through a time delay interlock that prevents immediate re-opening of the switch after closure. This allows time for the fuses to function if the switch has been closed against a fault.

MAXIMUM VERSATILITY is possible with General Electric's Rollout Switch and Fuse because the equipment is available as an indoor or an outdoor unit. Either type can be furnished single, multiple, or in a line-up with metal-clad switchgear.

FOR MORE INFORMATION contact your General Electric Apparatus Salesman, or write to Section 511-27, General Electric Company, Schenectady 5, New York.



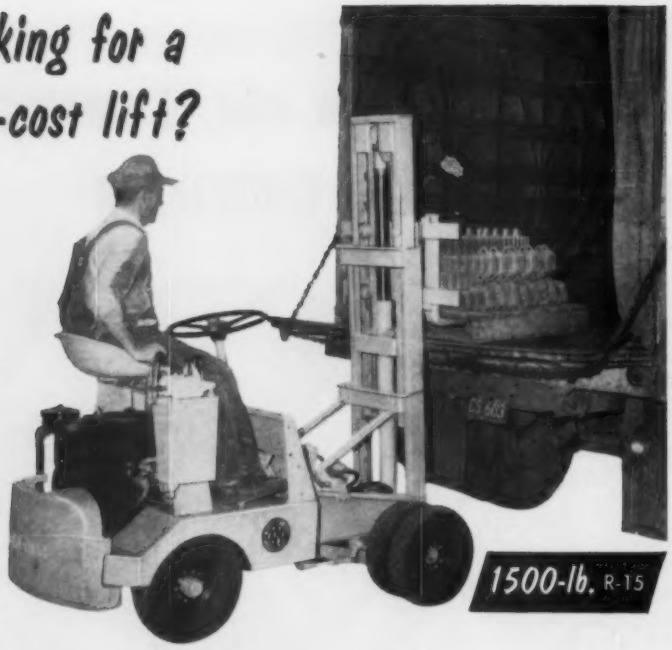
ROLLOUT FEATURE simplifies maintenance. Insulation is shown cutaway to give position of switch and fuse elements.

Progress Is Our Most Important Product

GENERAL ELECTRIC

For more facts circle 599 on Reply Card

Looking for a low-cost lift?



If you still think of fork lifts in terms of $2500 to $4000 or more per unit, you're in for a pleasant surprise! *For much less,* Moto-Bug puts labor-saving fork lift service within economical reach of small plants — and has unlimited usefulness as an auxiliary low-cost material-handling tool for heavy industry.

You get 7-foot lifting height and 1500-pound capacity (at 15-inch load center) with R-15 Moto-Bug. It has adjustable forks, power-tilt mast, speeds up to 12 m.p.h. forward and reverse, *plus* automatic power-flow transmission — *no clutching, no shifting.* R-15 weighs only 2060 lbs. It works on light ramps and over old warehouse floors where heavier lift trucks cannot safely travel.

For lighter work, there's a low-cost Kwik-Mix S-10 Moto-Bug with 1,000-lb.-capacity, 6-foot fork lift attachment. Weighs only 1575 lbs. — has 20 or 30-inch forks, adjustable 6 to 32 inches wide, full power forward and reverse, short 61-inch turn radius. Tilting mast optional.

3-tool usefulness

Both models are available with multiple attachments. Fork lift is quickly interchangeable with ¾ or 1-ton hopper bodies or flatbed platforms for diversified material-handling. Better check the *big savings* you can earn with a *small investment* in Moto-Bug. See your Kwik-Mix distributor or write us for literature *today.*

KWIK-MIX Company, Port Washington, Wis.

SEND US DETAILS ON: ☐ R-15 ☐ S-10 FORK LIFT

NAME_____

TITLE_____

COMPANY_____

DIVISION_____

STREET_____

CITY, STATE_____

KM776 PE

KWIK-MIX MOTO-BUG
A DIVISION OF KOEHRING COMPANY

For more facts circle 600 on Reply Card

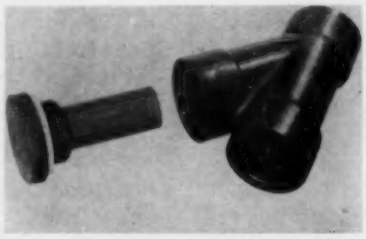
NEW PRODUCTS

(Begins on page 172)

deep pitch fans, these towers are belt-driven at low speeds by weather- and splash-proof motors to give a new low in cooling tower noise. According to manufacturer, these towers carry a guarantee on wetted deck surfaces against rotting or damage due to fungus attack, and they offer increased corrosion resistance. Other features announced include sealed fan bearings lubricated for life, and gravity-type distributing panes to reduce pumping head and cut down windage losses. Halstead & Mitchell.

34—SEDIMENT STRAINER of rigid polyvinyl chloride

Made of highly corrosion-resistant rigid polyvinyl chloride, this Y-sediment strainer is designed for service on alkalis, acids, inorganic salt solutions and other corrosive materials. Strainer is of rigid PVC sheet with



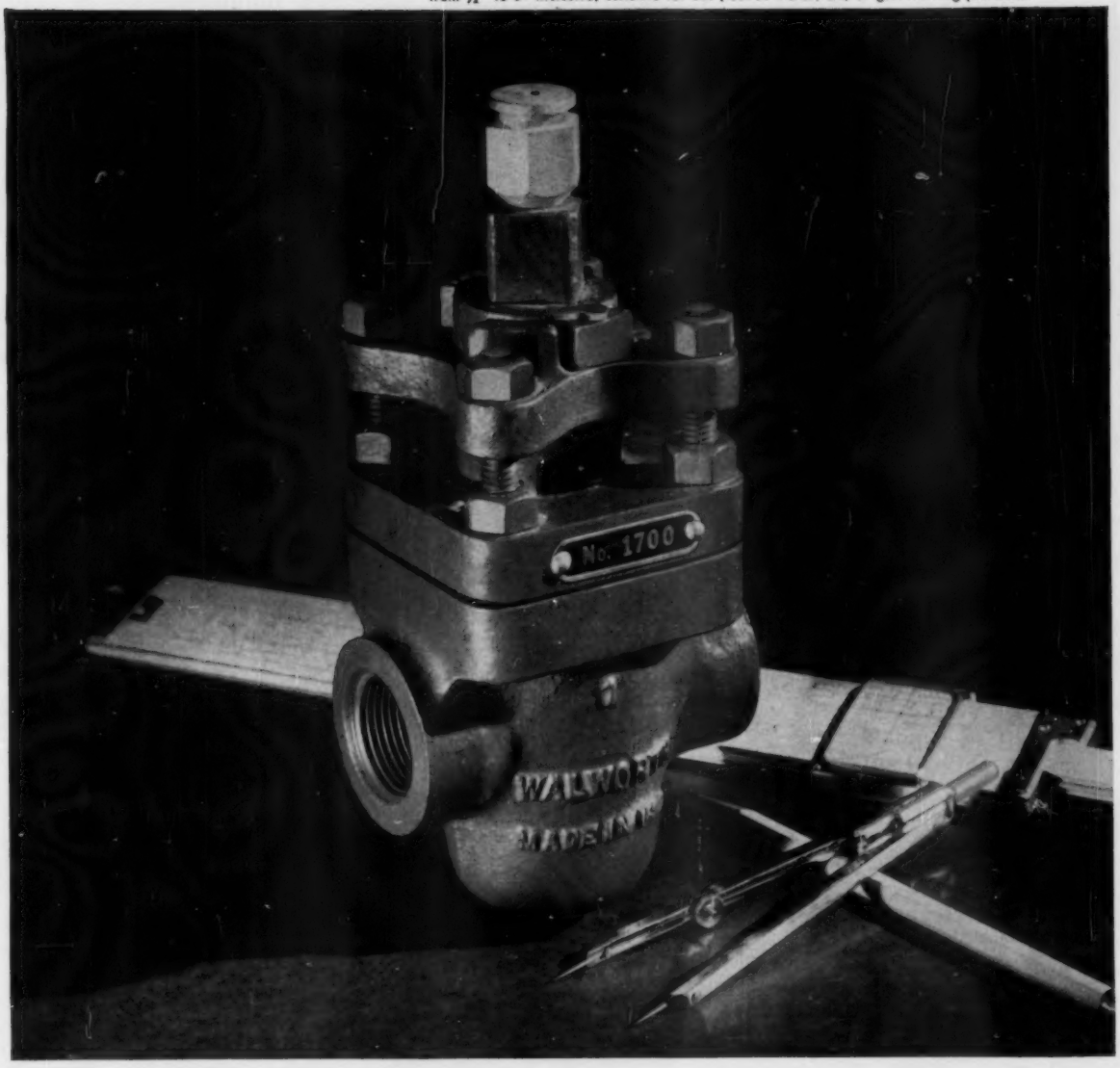
1/32 in. holes. Open area of perforated screen is described as at least twice the cross sectional area of corresponding Schedule 80 pipe to assure adequate flow. Light in weight, strainer is said to be easily handled and installed. The screen, which is welded to strainer cap, is merely unscrewed for cleaning. Strainer has a service rating of 150 psi at 75 F and 75 psi at 150 F. It is available with either threaded, solvent-weld socket-type or flanged ends, comes in five sizes from ½ through 2 in. Walworth Co.

To receive product data circle item numbers on the handy Reader Service Cards provided on pages 237-238.

35—LIQUID CLEANER improves contact performance

Cramolin is announced as a liquid electrical contact, an anti-corrosive, as well as a lubricant for electrical contacts of almost all types and conditions. It is claimed to work especially well

Illustrated here is the Walworth Lubricated Plug Valve No. 1700, available in sizes from ½" to 5" inclusive, suitable for 200 pounds water, oil, or gas working pressure.



problem-solvers for tough jobs

*LPV's by WALWORTH

If you're familiar with the basic advantages of Plug Valves, you know why Walworth Lubricated Plug Valves work so well in really tough spots. You know about their direct port opening . . . their dead tight shut off. Seating and sealing surfaces are fully protected from attack by fluids being handled by insoluble lubricants.

*Lubricated Plug Valves

Remember, you can get Walworth LPV's in all sizes . . . from ½ to 30 inches . . . for pressures up to 5000 psi and for vacuum service . . . in a number of different styles and patterns. For more information about LPV's and for your copy of the new Walworth LPV Circular, see your local Walworth Distributor.

WALWORTH

60 EAST 42nd STREET, NEW YORK 17, N. Y.

DISTRIBUTORS IN PRINCIPAL CENTERS THROUGHOUT THE WORLD

WALWORTH SUBSIDIARIES: ALLOY STEEL PRODUCTS CO. • CONOFLOW CORPORATION • GROVE VALVE AND REGULATOR CO. SOUTHWEST FABRICATING & WELDING CO., INC. • M&H VALVE & FITTINGS CO. • WALWORTH COMPANY OF CANADA, LTD.

For more facts circle 601 on Reply Card

PREMETCO SERVICE REPORT
Tatum Gasoline Plant's first stage processing and chiller units have year 'round Premetco insulation protection.

Weatherproofing for Outdoor Gas Processing Equipment

New Tatum Gasoline Plant

ALUMINEL PROTECTED

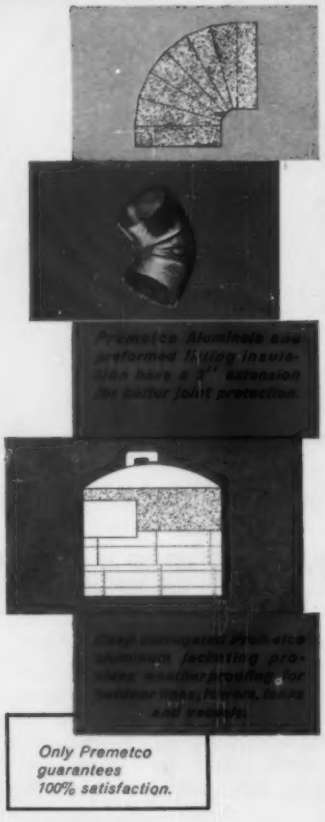
This compression refrigeration type gasoline plant depends upon exact temperature control. Insulated equipment subjected to temperature variations is located outdoors. The problem was to protect this exposed insulation against cracking, weather and accidental damage.

Certified Insulation Company, called in for the job, suggested new Premetco Aluminels and deep corrugated aluminum jacketing. Made of pure aluminum and completely preformed with a bonded-to-metal moisture barrier, Premetco insulation covering gives years of trouble-free weatherproofing. At the Tatum plant the towers, lines, chillers and compressor exhaust manifolding all received Premetco Aluminum protection.

Using Premetco insulation protection reduces labor costs by as much as 75%. Additional savings are realized when changing lines as Premetco Aluminels and jacketing are easily removed and reinstalled.

For your next installation be sure to specify Premetco for better insulation protection.

Complete on hand stock available for pipe sizes 1½ inches through 12 inches . . . write or call today . . . material samples on request.



PREMETCO

Excellent territories open to manufacturers representatives. Inquire directly.

PREFORMED METAL PRODUCTS CO., INC., *P.O. Box 1134 Shreveport, Louisiana*

For more facts circle 602 on Reply Card

NEW PRODUCTS

(Begins on page 172)

on older electrical contacts that have seen considerable service. According to manufacturer, Cramolin reduces contact resistance by dissolving and removing non-metallic layers of oxide and sulphide; is effective on all metals, including gold alloy as well as galvanized, silver-plated contacts, contact metals of copper, brass, bronze or nickel; is non-poisonous and inoffensive because it is free from acids and alkalis. Caig Laboratories.

36—PALLET TRUCKS have more space for batteries

Transporter Models WPY-4 and 6 are 4000- and 6000-lb low lift pallet industrial trucks announced as providing space for approximately 50 per cent additional power as compared with many trucks. This increased battery space was realized by enlarging the

battery compartment to 15½ in., enabling it to accommodate up to six-cell 23-plate lead acid batteries, or the equivalent. The new models are claimed exceptional in that a majority of manufacturers' sizes and types of batteries now on the market for use in driver led equipment can be used. Ability to use larger batteries is important when equipment is operated under heavy current draw conditions such as steep ramps and where work is continuous with full capacity loads, company notes, and even with the larger battery compartment, this low-lift truck measures only 29 in. plus length of load. It has a maximum steering angle of 200 deg for narrow aisle maneuverability. Automatic Transportation Co.

37—DECREASING COMPOUND is water emulsifiable

Grease Ban is a water emulsifiable degreasing compound which can be used full strength or diluted with kerosene to remove oils, grease, dirt, and

For more facts circle 603 on Reply Card ——→

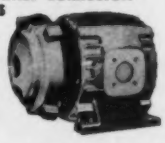
rough CONDITIONS?

TYPE J
1 TO 30 H. P.
Rerated Frames
182 to 326U

U.S. TOTALLY-ENCLOSED MOTORS

Protected **AGAINST CORROSION ALL EXPOSED PARTS CAST IRON...**

Rust-resistant solid cast iron withstands abuse, wear and corrosion. *Protects* working parts!



Protected **BY LUBRIFLUSH FOR LONGER BEARING LIFE**

New grease forces old grease out—keeps bearings fully lubricated. *Protects* bearing efficiency!

Protected **AGAINST INTERNAL HEAT WITH ASBESTOS WINDINGS**

Nature's greatest heat resistor, asbestos can't carbonize! *Protects* windings against heat!

Protected **FROM STRESS AND WARP BY NORMALIZING CASTINGS...**

All cast-iron components are heat-seasoned to stabilize molecular structure. *Protected* against warp!

Total Protection in every direction

Large savings are being gained by many industries using *enclosed* motors in place of the usual "open" or ordinary protected motor. U.S. Totally Enclosed gives *total* protection in every direction—from corrosion, dusts, abrasives, impact, weather, spray and splash! This means motor dependability ...long life...savings both on motor costs and production continuity!

MAIL COUPON NOW ▼

U.S. *Electrical* MOTORS

U.S. ELECTRICAL MOTORS, Inc.
Los Angeles 54, Calif.—Box 2058, Milford, Conn.

PE-12

Gentlemen: Please send me complete information in your Totally-Enclosed Motors.

NAME_____

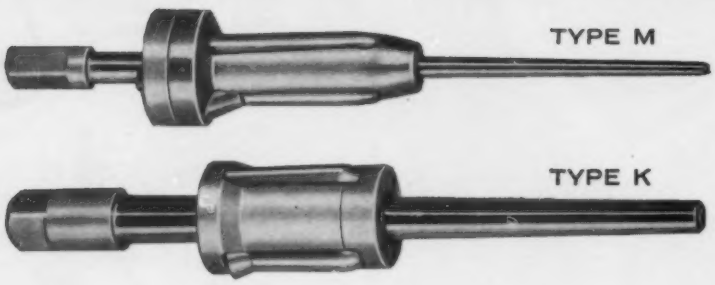
COMPANY_____

ADDRESS_____

CITY_____ ZONE____ STATE_____

write for your copy of this Bulletin!

ELLIOTT
Boiler Tube Expanders
for tubes 3/4 in. I.D. and up



This 16-page bulletin describes general types of Elliott boiler tube expanders for fast, efficient tube rolling jobs. It also gives dimensions, prices and other descriptive data and shows various drum, header and short series mandrels which are used with Elliott boiler tube expanders. Drum mandrels are seen with Type M and Type K above.

Accessories available to adapt Elliott boiler tube expanders to various tube rolling applications include universal joints and extension shafts, sockets, gear drives, etc. A new heavy-duty, right-angle gear drive utilizes roller bearings to minimize friction, cutting down power losses.

Write the Elliott Company, Lagonda Division, Springfield, Ohio, *today*, for your copy of Bulletin Y-46.

Y7-5

ELLIOTT Company
For Tube Cleaners, Expanders and Accessories

STEAM TURBINES • MOTORS • GENERATORS • DEAERATING HEATERS • EJECTORS • CONDENSERS • CENTRIFUGAL COMPRESSORS • TURBOCHARGERS • TUBE CLEANERS • STRAINERS

For more facts circle 604 on Reply Card

NEW PRODUCTS

(Begins on page 172)

tar from metals, concrete and glass. Applied in proper strength for the job, it is simply washed off with water, company says, without leaving an oil film on the object cleaned. In addition to its use for degreasing metal parts prior to plating, finishing, or assembly, Grease Ban is used in maintenance for removing grease and oil spills from floors, and for removing grease and dirt from laboratory glassware and factory windows. Because it has a phenol coefficient of 2.5 which provides disinfectant properties, it is also suggested as a general plant cleaner. Parke-Hill Chemical Corp.

38—MAINTENANCE KIT promotes gage block care

Under a new packaging program this manufacturer supplies, without cost, the necessary tools for gage block maintenance with gage block sets of 38 pieces or larger. The complete kit consists of a Black Granite-Diorite deburring stone, camel's hair brush,

insulated forceps, box of wipers, two informative booklets and two Aerosol type liquid containers with specially compounded liquids for gage block care, one a preservative and the other, a gage block cleaner. Booklets included are "The Facts of Gage Block Life" and "How to Be Your Own Bureau of Standards." The gage block sets, which are packaged with the maintenance kits are sealed in an air exhausted plastic bag, which also contains a package of silica jel for moisture protection. The DoAll Co.

39—ABSORBENT PAD keeps oil drips off floor

Oil drippings can be eliminated with Tufflex Fabric Super-Sopper, it is announced. Super-Sopper is a highly absorbent pad that is placed under machinery to catch the oil drippings. Life of pad depends on how much liquid it absorbs, but many plants report using the same pad for several weeks.

2 NEW INVINCIBLE
Industrial Vacuum Cleaners
For Heavy-Duty Cleaning in Close Quarters

These rugged, versatile Invincible Models are designed for use in highly congested areas and to meet specific requirements created by modern production methods and present day maintenance standards. They are engineered to reduce costs and increase efficiency on special production problems and intermediate applications that cannot be handled by undersize machines or economically by bulky, oversize equipment.

COMPACT—AND EFFICIENT. Even though these Invincibles are amazingly compact, filter area has not been sacrificed.

PORTABLE. Mounted on a swivel wheel carriage only 20½" wide and weighing less than 330 pounds, they follow the operator with a slight tug on the hose through narrow aisles and over rough floors.

VERSATILE. Designed for rough, heavy-duty service and continuous operation, they recover, reclaim and convey virtually any material: metallic litter, liquids, fabricated parts, dirt, dust, etc., etc.

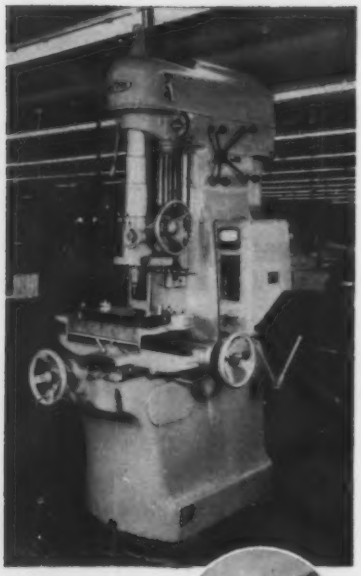
TROUBLE-FREE. Even highly abrasive litter is safely handled; no recovered material comes in contact with moving parts.

WRITE TODAY *for full details on new Invincible Models 300 (3 H.P.) and 501 (5 H.P.)*

INVINCIBLE

VACUUM CLEANER MFG. CO.
DOVER, OHIO
OVER 50 YEARS THE LEADER IN INDUSTRIAL VACUUM EQUIPMENT

For more facts circle 605 on Reply Card



Moore Jig Borer installed on AIR-LOC mounts without bolts or cement.

Only VINYL

Air-Loc®

4·17·4

machine mounts give you all these advantages

- *Complete resistance* to oil, water, etc.
- *Precision shimming* is easy.
- *Reduced* machine vibration & noise — as much as 85%.
- *Low* initial cost.
- *Reusable* when you move machines.
- *Eliminate* bolting and cementing.

Return coupon for samples and booklet about AIR-LOC. No obligation.

FREE SAMPLES

AIR-LOC DIVISION
Clark, Cutler, McDermott Company
Franklin, Massachusetts

Please send samples and AIR-LOC booklet to:

NAME.....
(Please print)

COMPANY.....

ADDRESS.....

CITY.....ZONE....STATE.....

For more facts circle 606 on Reply Card

NEW PRODUCTS

(Begins on page 172)

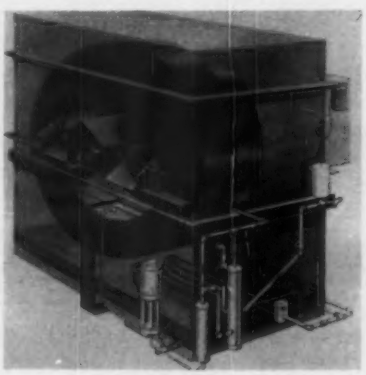
The material comes in sizes from 1 sq ft to 1300 sq ft, in squares, rectangles or intricate shapes. According to manufacturer, each pad is sufficiently strong and stiff for handling and placement under machines with as little as ½ in. clearance. Wood Conversion Co.

40—SHUT-OFF VALVE features positive seating

Figure 202 is a quick-acting shut-off valve for air, water, gas or oil service. Features announced include positive seating by spring and line pressure; a replaceable resilient disc for positive seal; full opening or closing by 90 deg movement of handle; cam to hold handle in open position; also vertical or horizontal position of the handle indicates whether valve is open or closed. It is made in ⅜, ½ and ¾ in. sizes for use on pressures to 150 lb at temperatures to 250 F. Bulletin 39-8 gives details. Homestead Valve Mfg. Co.

41—DEGREASER is low cost, compact unit

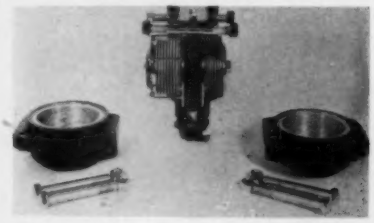
Greater efficiency and economy in metal cleaning by combining solvent degreasing with automated work handling is reported for the Model 1DD 750. This rotary drum degreaser is said to require only a minimum investment, yet fill the needs of a wide range of degreasing operations. It cleans nuts, bolts, fasteners, stampings and screw machine parts. Steam heated and measuring only 6½ ft wide, 6 ft high and 4 ft in direction of work flow, the Model IDD750 is compact enough for limited space use. It is designed to handle 5 cu ft per hour with a rated capacity of 2000 lb of steel or brass per hour. Parts to be cleaned enter via a chute and are carried through the unit by a screw-type drum which gently tumbles the parts.



subjecting them to vapor and immersion cleaning and final vapor rinse and drying. Parts are discharged through a chute on the opposite side. Detrex Chemical Industries, Inc.

42—FLOW METER for the oil and chemical industries

This bellows-type flow meter is claimed accurate to within ½ of 1 per cent, and to maintain this accuracy even when ambient temperature changes by as much as 100 F and static pressure reaches 2500 psi. A differential pressure measuring device, it is designed primarily for the oil and chemical industries, but is expected to find



use also in metal processing and other fields. In operation, differential pressure is applied to the bellows unit through high and low pressure connections. As differential pressure changes, the liquid fill in the bellows unit moves from high to the low pressure side, or vice versa, changing the tension of the range spring. This moves the bellows connecting rod, repositioning the torque tube arm. The torque tube shaft is connected to the transmitter unit so that a change in differential pressure changes the transmitter output. Range of the flow meter may be changed in the field by springs available in 15 different ranges between 0-20 and 0-400 in. of water. Minneapolis-Honeywell Regulator Co.

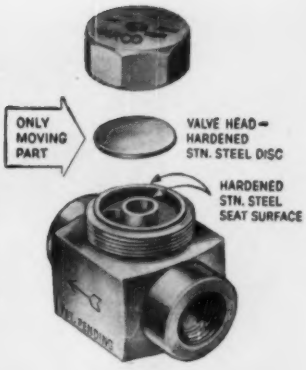
43—MULTIFOLD PAPER TOWEL has larger drying area

The width of this multifold paper towel, Brand 180, has been increased by ⅜ in. The increase has added 3½ sq in. to the drying area of the towel and 1½ lb to the average case weight. The towel area has been increased to 92.58 sq in., with no increase in selling price. The new size is also said to contribute to dispensing efficiency through standard multifold towel cabinets. Cases contain 15 sleeve packages, with 250 towels per sleeve. Sheet size is 9⅜ by 9⅞ in. Scott Paper Co.

44—POWERED TRUCKS are corrosion-resistant

All units in this company's line of Powrworker powered hand trucks are now available in corrosion resistant models. They are designed for use in

HOW TO
reduce steam trap inventory and practically eliminate maintenance
with the unique Sarco TD Thermo-Dynamic



ONE TYPE OF STEAM TRAP FOR PRACTICALLY ALL APPLICATIONS

The Sarco TD Thermodynamic is the most versatile steam trap ever developed.

It has large capacity . . . but small size. Insures rapid, continuous, complete drainage of condensate at saturated steam temperature. Has high air venting capacity.

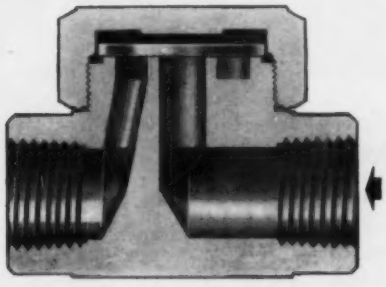
Operates perfectly on all loads . . . and when pressure fluctuates. Freeze-proof, when installed with outlet down. Highly resistant to superheat, water hammer, corrosive condensate.

ONE LARGE CAPACITY SEAT FOR ALL PRESSURES — 10 TO 600 PSI

Yes, in each size Sarco TD trap the same large capacity seat accommodates all pressures 10-600 psi . . . for heavy, light, or no condensate loads. Sizes ⅜ to 1".

Self-adjusting throughout entire pressure range . . . not a single change or adjustment required.

No need to stock seats and heads for various loads and pressures. Inventory simplified and reduced.



TROUBLE-FREE DESIGN NO VALVE MECHANISM — ONLY 3 PARTS

Look at that cross-section, left. That's all there is to a Sarco TD! What could be simpler?

Only 3 simple, rugged parts (single pieces — not assemblies) . . . all stainless steel. Only *one* moving part . . . a solid hardened stainless steel disc.

No mechanism . . . the kinetic energy of steam closes the valve. No narrow channels to choke. No gaskets to leak.

Actual service experience . . . in hundreds of plants . . . under severest conditions . . . has proved that the Sarco TD PRACTICALLY ELIMINATES MAINTENANCE.

2215-B

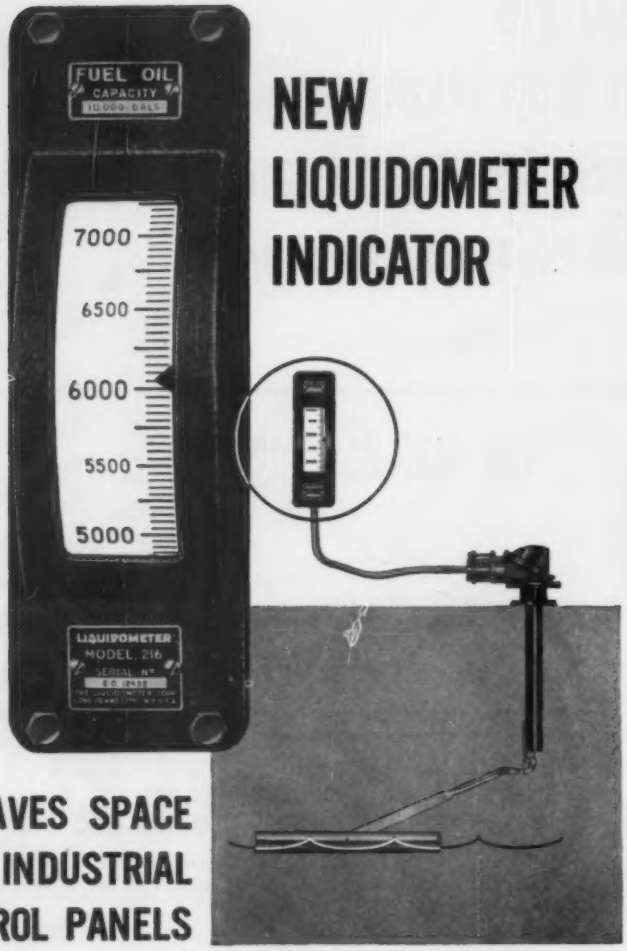
SARCO Thermo-Dynamic TRADE MARK **STEAM TRAP**

60-DAY TRIAL CONVINCES

We will gladly send you a Sarco TD steam trap and strainer for 60-day trial. No cost or obligation. You buy ONLY if completely satisfied. Advise sizes—⅜, ½, ¾ or 1"—and application. Sarco Company, Inc., 635 Madison Ave., New York 22, N. Y.

THE MODERN TRAP THAT IS MAKING STEAM TRAPPING HISTORY!

For more facts circle 607 on Reply Card



NEW LIQUIDOMETER INDICATOR

SAVES SPACE ON INDUSTRIAL CONTROL PANELS

Twenty-inch dial in 3x10¼" case permits close readings

The new Liquidometer Model 216 Indicator gives the plant engineer a reliable, automatic reading of storage tank contents. Available in either vertical or horizontal design, the compact and highly readable Model 216 Indicator makes possible multiple installations on crowded control panels.

Teamed with Liquidometer's time-tested hydraulic transmission gaging system, the new indicator provides instantaneous remote indication of liquid levels—automatically. No outside power source is required. Virtually any liquid may be measured, and the indicator can be located up to 250 feet from the tank.

Engineered for dependability, the Liquidometer gaging systems highlight these design features:

- Maintenance free
- Integral temperature compensation
- Ease of installation—requires only one 2" diameter tank opening
- Safety—all gages Underwriters approved for hazardous liquids

For further details on the new Model 216 Indicator, write Dept. B.

THE LIQUIDOMETER CORP.
SKILLMAN AVENUE AT 36th STREET
LONG ISLAND CITY 1, NEW YORK

For more facts circle 608 on Reply Card

NEW PRODUCTS

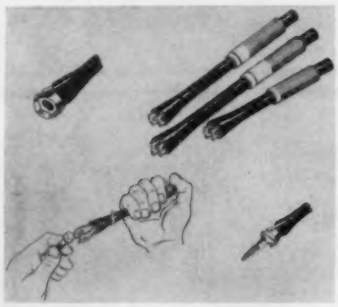
(Begins on page 172)

meat and poultry houses, tanneries, canneries, pickle plants, cold storage warehouses and similar areas where materials handled contain excessive quantities of acid, salt or other corrosive agents. Anti-corrosion characteristics are obtained through modification of regular Powrworker units. The drive motor, lift limit and deadman switches are totally enclosed. An undercoating protects the bottom of the machine. A special wiring harness is treated to prevent deterioration of insulation. The lift piston is of stainless steel so that it will not pit or damage seals. Corrosion resistant construction can be specified on any model at moderate additional cost. Clark Equipment Co.

Reader Service Cards On pages 237-238 make it easy to get further information on any of these products. Just circle the item numbers of the products you would like to know more about.

45—WRENCH tightens or loosens nuts, bolts

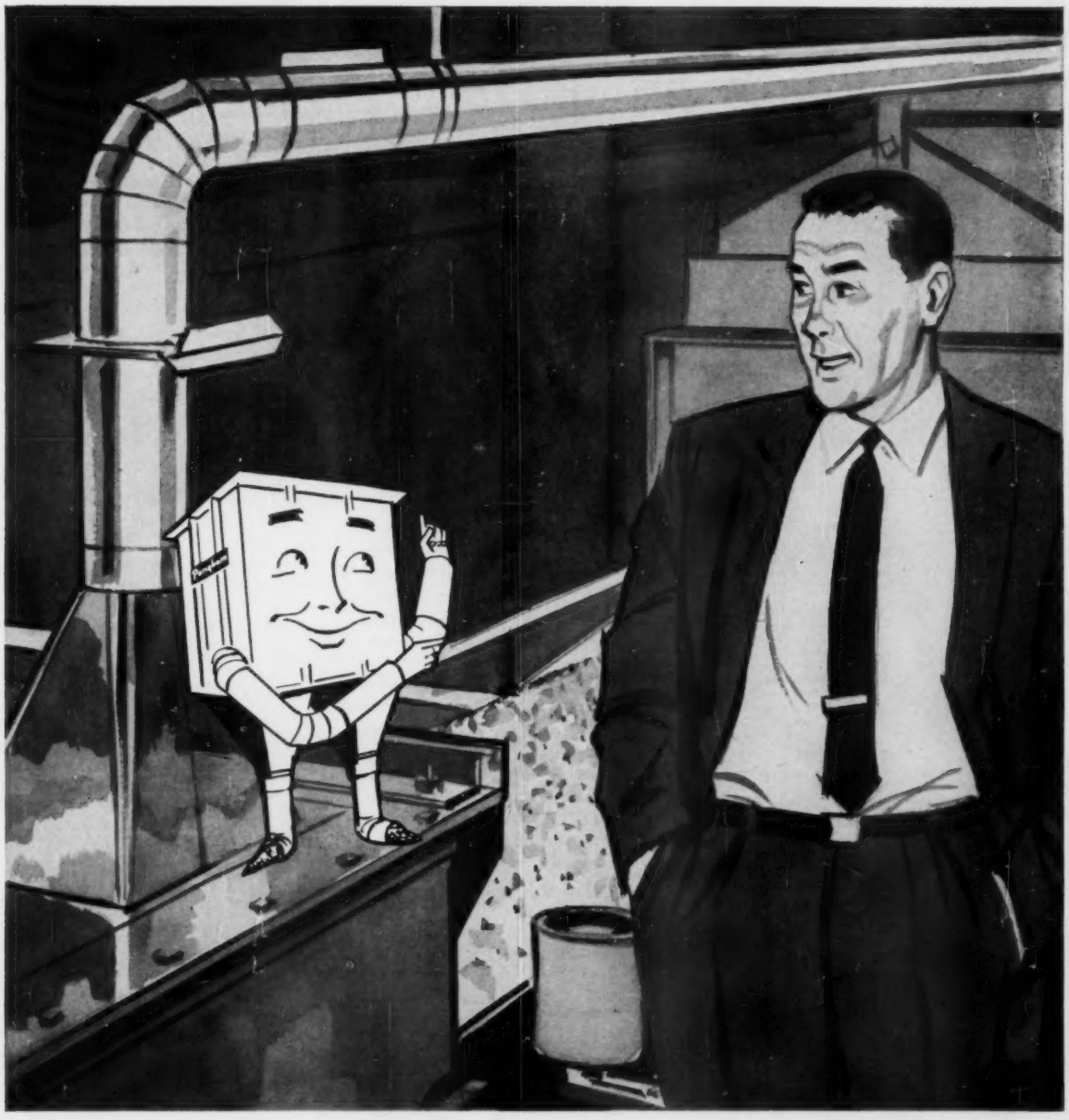
The Tip Wrench is designed to eliminate finger fumbling and make it easier to work in hard-to-reach places. It tightens or loosens nuts, bolts, and



slotted machine screws. By applying thumb pressure on the plunger head, the jaws open and slide out to the desired size—as pressure is released the user is ready to complete the job. The Tip Wrench comes in sizes to handle No. 2 to No. 12 nuts and bolts. Tipco Mfg. Co.

46—DISCONNECT, BUS DUCT combined in one unit

The Iso-Duct is a combination of the disconnect Isolator and bus duct, arranged for future extension in



"What? A 15% increase in production machinery life?"

Yes, Pangborn Dust Control can increase your machinery life up to 15% or more! Pangborn Dust Collectors trap dust controlled at the source to prevent the abrasive wear and tear of uncontrolled dust settling in valuable equipment. Pangborn Dust Control can save you thousands of dollars by substantially lengthening the life expectancy of your machinery.

What's more, Pangborn gives you other benefits of lower housekeeping costs, higher employee efficiency, extra profits from any salvage value and better employee and community relations. And Pangborn offers a complete line of collectors, dry and *wet*, for all jobs.

Why not discover how you can profit from Pangborn Dust Control? Write for Bulletin 922 to: PANGBORN CORP., 3200 Pangborn Blvd., Hagerstown, Md. *Manufacturers of Dust Control & Blast Cleaning Equipment.*

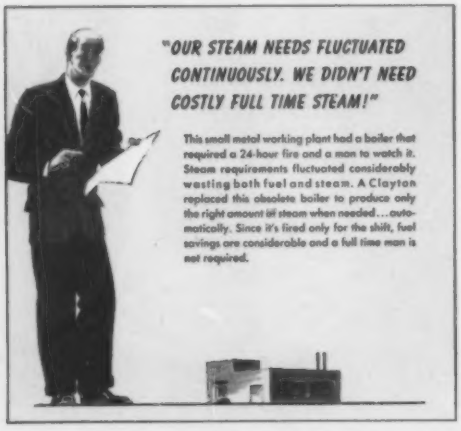
Pangborn CONTROLS DUST

For more facts circle 609 on Reply Card

How a Clayton STEAM GENERATOR

"WE WERE FACED WITH AN OBSOLETE CENTRAL BOILER ROOM AND DETERIORATING TRANSMISSION LINES"

This well known chemical company had a sprawling plant with long transmission lines and condensation problems. Fluctuating steam needs throughout the plant made steam production a problem. The ordinary boiler had to be kept at full pressure all day...fired all night. Seven Clayton Generators strategically located now provide just the right amount of steam—when and where needed. They are shut down at night. These seven Clayton generators installed cost less than the cost of new transmission lines.

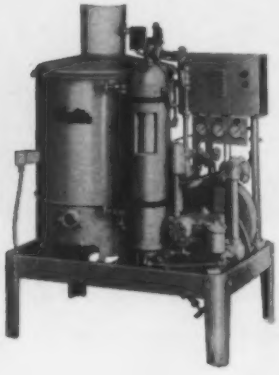


"OUR STEAM NEEDS FLUCTUATED CONTINUOUSLY. WE DIDN'T NEED COSTLY FULL TIME STEAM!"

This small metal working plant had a boiler that required a 24-hour fire and a man to watch it. Steam requirements fluctuated considerably wasting both fuel and steam. A Clayton replaced this obsolete boiler to produce only the right amount of steam when needed...automatically. Since it's fired only for the shift, fuel savings are considerable and a full time man is not required.

SOLVED THREE different STEAM PROBLEMS!

These actual case histories represent only a few of the reasons why smart business men buy Clayton Steam Generators. Basically the story is more steam at less cost in only one fourth the space occupied by ordinary steam boilers. They cost less to install too... no stacks to erect, no walls to knock out, lower rigging expense and lower hauling costs. The secret of Clayton's higher efficiency is *controlled circulation*—no space consuming straight tubes, but instead, a principle of using a coil without fired vessels... easier to operate and maintain. From a cold start, Claytons produce steam in 3 minutes. Let a Clayton representative give you the complete facts.



"IT WAS HOPELESS! WE NEEDED MORE STEAM AND WE DIDN'T HAVE ROOM FOR IT!"

Here was a well known beverage syrup company located in "midtown" squeezed in between buildings on all sides. To meet its additional steam needs, it went in only one direction ...up! Since a Clayton produces the same amount of steam in only one fourth the space and weighs only a fraction as much as an ordinary boiler, it was relatively simple to put two Clayton steam generators on the roof! The installation was quick and inexpensive.

EXCLUSIVE!

Compare Clayton's 5-year published coil warranty covering material and labor.

Clayton MANUFACTURING COMPANY

Sirs:
Please send us more information on Clayton Steam Generators.

Name _____

Company _____

Address _____

City _____ Zone ____ State _____

We use steam for _____

Send to: Clayton Manufacturing Company
401 N. Temple City Blvd.
El Monte, California

For more facts circle 610 on Reply Card

NEW PRODUCTS

(Begins on page 172)

either direction. The design allows for any number of Isolator and pothead combinations that can be interchanged when re-arrangements are necessary. Iso-Ducts are particularly advantageous for plants where power demands vary, it is said, and are an excellent way to keep down future expansion costs. Working parts of Isolator are fully enclosed, and straight line telescoping action is designed to perform disconnect operations using a third of the space needed for comparable blade type switch. Electrical Engineers Equipment Co.

47—ROLL-ON ROOFING has broad industrial use

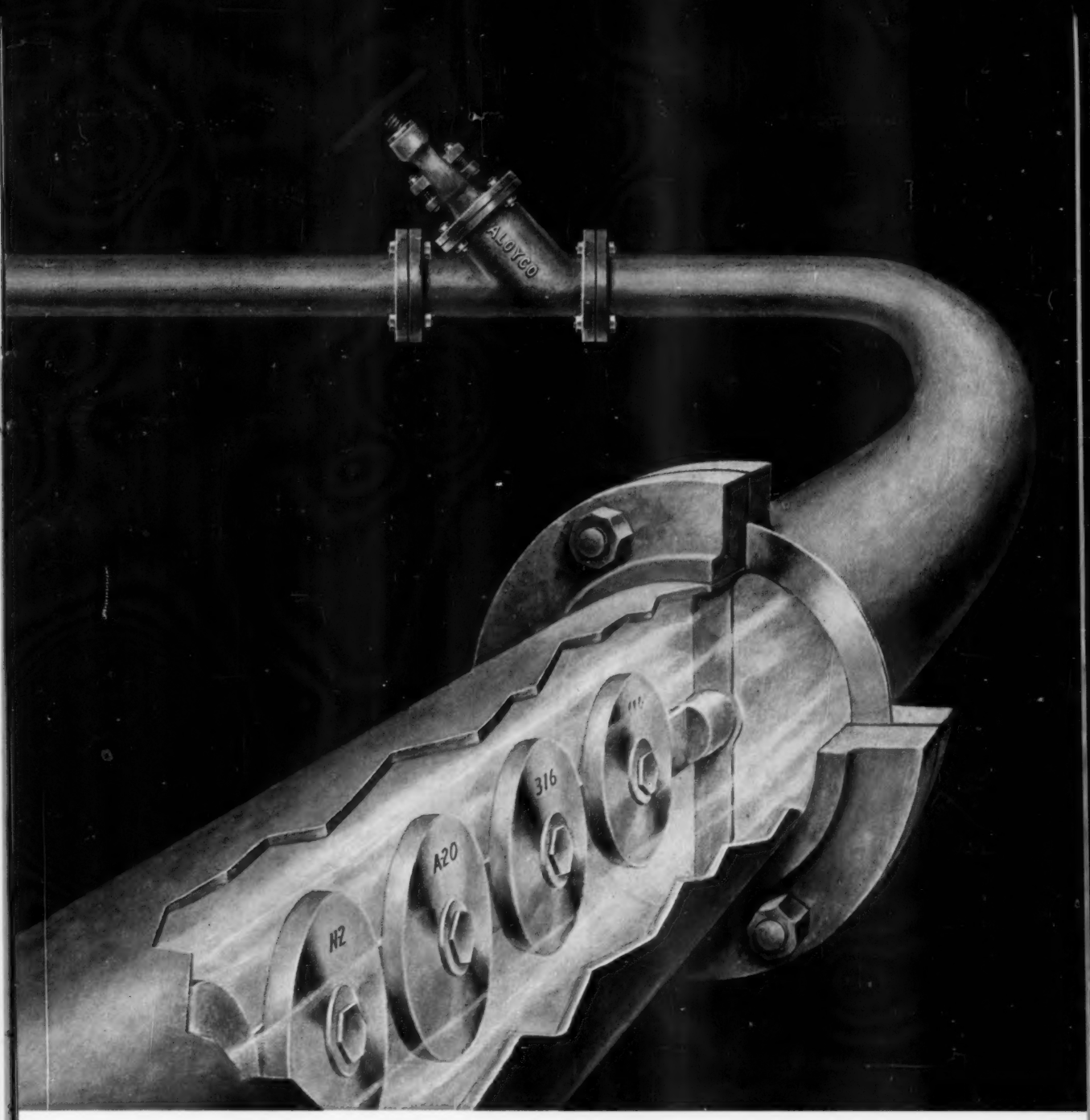
Cecoroll gives a weather-tight seal with a minimum of labor, according to manufacturer, and is suggested for roofing and siding on warehouses, garages, machine shops, storage sheds and other industrial buildings. Because of Cecoroll's flat crimped nailing edges, it is not necessary to match

corrugations and it is easier to start nails, company points out. Cecoroll is rolled on just as a rug is laid down. The rolls come in 30- and 15-in. widths, are 31 ft long and have edges sealed with a factory-applied mastic lap sealer. Cecoroll is reported to take 25 per cent less time to apply than many roofings and to require less framing, fewer nails and no solid sheathing. Finally installed cost is said to be about the same as for conventional corrugated sheet steel. Ceco Steel Products Corp.

48—FLEXIBLE COUPLING has rubber toothed sleeve

There are only three basic parts to the Sure-Flex Coupling: two hub flanges and a two-piece rubber sleeve. Internal and external teeth of the flexible sleeve mate with the flange hub teeth and lock under torque load without clamps or screws. The elastic rubber sleeve with two planes of engagement ab-

For more facts circle 611 on Reply Card ——→



Inside look at Aloyco Corrosion Engineering Service

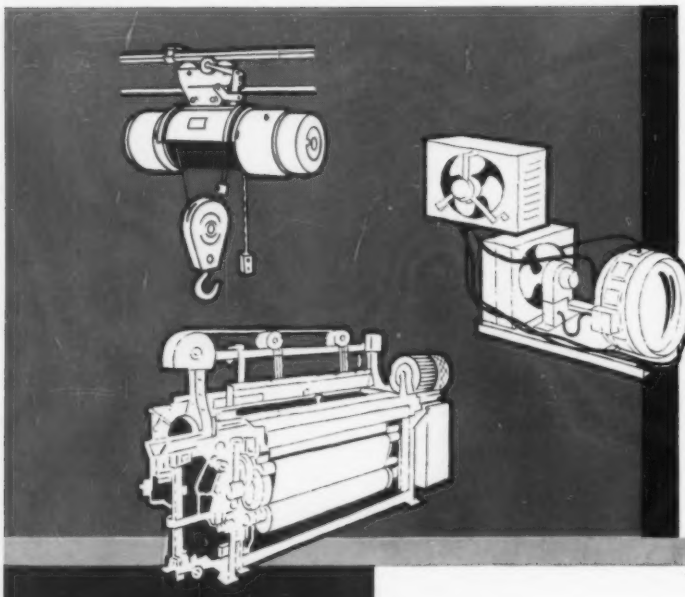
This is a realistic illustration of an Aloyco line test—as it might be conducted in your plant as a regular part of Aloyco Corrosion Engineering Service.

Whenever there is no 'book solution' to a specific valve problem, we will prepare a test rack carrying a series of alloy specimens (discs above) to be inserted in your process line. Purpose is to pinpoint the alloy that will most efficiently stand up to the specific corrosives under your actual line conditions.

Our sole purpose with the Aloyco Corrosion Engineering Service is to help you successfully solve corrosives-handling problems. Our resources are the metallurgical experience, foundry skills and engineering know-how we have gained in twenty-seven years as the world's largest specialist in Stainless Steel Valves.

Bring your corrosion problem to Alloy Steel Products Company, 1301 West Elizabeth Avenue, Linden, New Jersey. 7.2

ALLOY STEEL PRODUCTS COMPANY



Whatever You Manufacture...

in all types of motor-driven equipment your 3-phase motors can be **protected against burnout —** with built-in KLIXON Protectors

Now your 3-phase motors can have the same engineered protection that motor manufacturers have supplied for years in single phase motors. That's because more and more motor manufacturers are making available 3-phase motors with built-in KLIXON Protectors.

You can get this protection against costly burnouts — protection that means maximum work output and minimum down time — in your 3-phase motors from fractionals up through 7½ HP (600V).

Get the details from your motor supplier . . . then specify and use motors with KLIXON Protectors. The additional cost is small, the savings worthwhile.

Built-in KLIXON Automatic and Manual Reset Protectors for single and 3-phase motors:

- Reduce production down time
- Eliminate motor burnouts
- Minimize motor repairs and replacements
- Assure maximum motor capacity
- Simplify motor controls

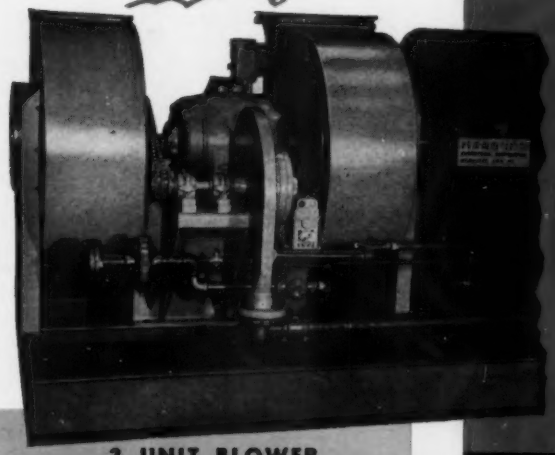
METALS & CONTROLS CORPORATION

Spencer Thermostat Division 4512 Forest Street, Attleboro, Mass.

KLIXON®

For more facts circle 612 on Reply Card

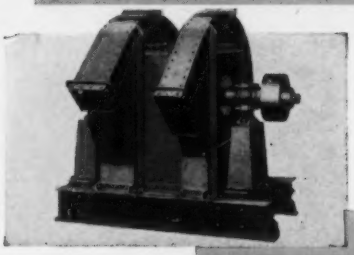
WHAT Bayley MEANS by ENGINEERED Air-Handling Equipment



3 UNIT BLOWER

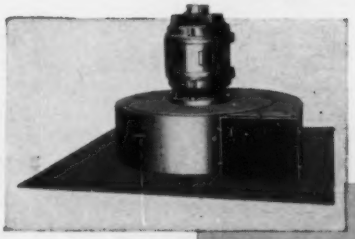
Consisting of One Unit for High Temperature, One Unit for Low Pressure, and a Third Unit For Secondary Combustion Air.

Complete unit built by Bayley for Mercury Engineering Corporation, Milwaukee, to handle three different pressures, volumes and temperatures of air for aniline rotary press.



DOUBLE BLOWER

1 Unit for High Pressure — 1 for Low Pressure.



SINGLE BLOWER

Designed for Dust Collection.

A UNIT FAN DESIGNED FOR SINGLE, DOUBLE, AND NOW TRIPLE APPLICATIONS!

Another advance in Air-Handling engineering and technique — a Triple Unit Blower designed and produced by BAYLEY . . . further evidence of the ability of this organization to successfully meet the specialized air-handling requirements of a wide range of industrial needs. Our engineering staff is always ready to consult with you regarding your problems.

Bayley

BLOWER COMPANY

ENGINEERED Air-Handling Equipment

1825 South 66th Street
Milwaukee 14, Wisconsin

For more facts circle 613 on ReplyCard

REMINDER!

Have you changed your electrical system over to winter?

Let's reduce motor burnouts this year. Remember to change your motor protectors back to winter ratings.

During the hot summer months, many maintenance departments are forced to up-rate the elements in motor protectors to prevent nuisance stoppages due to high temperatures. When winter comes, they neglect to change back to normal ratings. That's when many motor burnouts occur.

ELIMIN- .TE THE WHOLE PROBLEM

You can lick the whole problem, and eliminate motor burnouts too . . . just by using Heinemann Motor Controllers. The rating of Heinemann Motor Controllers is unaffected by heat or cold. No unnecessary stoppages in summer; no change-overs for winter.

The difference is that Heinemann Motor Controllers operate on power, not heat. Instead of thermal elements, they employ a hydraulic-magnetic principle that you should know about.

Send for a copy of Manual 101, *"What you should know about Circuit Breakers"* and Bulletin 1410 on Heinemann Motor Controllers. HEINEMANN ELECTRIC CO., 128 Plum St., Trenton 2, N. J.

HEINEMANN *Motor Controllers*

For more facts circle 614 on Reply Card

NEW PRODUCTS

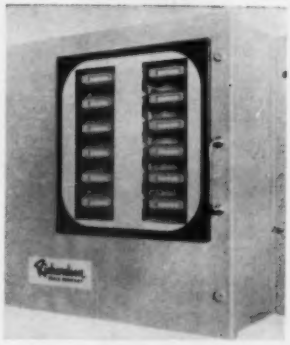
(Begins on page 172)

sorbs both angular and parallel misalignment, it is pointed out, and then since there are no rubbing or wearing surfaces there is no need for lubrication. Shock vibrations are absorbed and prevented from being transmitted by the coupling sleeve, says manufacturer and high torsional flexibility (about 15 deg at peak torque) provides smooth power transmission.

Sure-Flex Couplings are designed to tolerate angular misalignment up to 1 deg, parallel misalignment from 1/32 to 1/16 in., depending on shaft size, and free end-float up to ⅛ in., depending on size. According to company, angular or parallel misalignment does not generate unbalance or pulsations since flexing takes place within the rubber sleeve member, and operation is noiseless. Final assembly of the coupling can be made without tools, and declutching is reported equally easy. The couplings come in six sizes for motors from 3 to 80 hp. T. B. Wood's Sons Co.

49—COUNTER with totalizer keeps proportion records

To provide an inventory check on each ingredient being fed into a proportioning system, this counter records the weight of each ingredient used during any batch, or required time interval,



and totalizes the weight of all ingredients used. Sizes are available for recording anywhere up to 100 ingredients, the one shown is for 12 ingredients. Thus, when any ingredient is uesd in a batch, the inventory counter for that material will record in pounds the actual weight of material withdrawn from storage and used in the batch; and simultaneously the totalizer counter will also record the actual weight in pounds. When the next ingredient is introduced, the register for that one will record actual weight used and that same amount will be added to the totalizer counter. Each

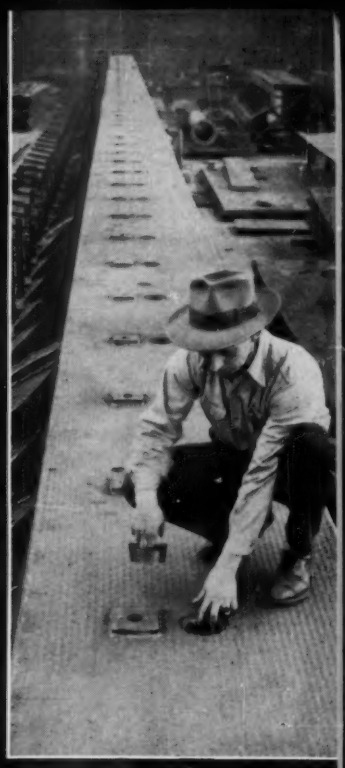
For more facts circle 615 on Reply Card ⟶

Multigrip Floor Plate . . .

structural strength plus safe footing on coke recovery lines

Through these huge recovery mains pour millions of cubic feet of coke-oven gas and tars, on the way to becoming myriad by-products. On top of the lines (surfaced with USS Multigrip Floor Plate) are spooning holes and liquor-flushing connections to clean the lines. **Safe Footing.** Plant workmen must walk on top of the lines, stepping over and around fittings. One slip could mean a serious accident. Here Multigrip performs an important safety job every time a worker puts his foot down. Evenly spaced, flat-topped risers with clean edges afford traction from *any* direction, even when the plates are wet. Multigrip wears indefinitely without chipping, cracking or splintering. And it's available in large plates that eliminate installation waste. For safety, for long wear, for easy installation . . . specify USS Multigrip Floor Plate.

Multigrip can be cut, welded or formed where necessary.



Flat-topped, evenly spaced risers on Multigrip provide safe footing for workmen.

This 140-ton coke-oven gas collecting main, built by Jennings Mfg. Co., Masury, Ohio, is constructed of USS Structural Steel with a walkway of USS Multigrip Floor Plate.

UNITED STATES STEEL CORPORATION, PITTSBURGH
COLUMBIA-GERRYA STEEL DIVISION, SAN FRANCISCO
TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA.
UNITED STATES STEEL SUPPLY DIVISION, CHICAGO
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS **multigrip**

FLOOR PLATE

Sold by leading distributors from coast to coast

UNITED STATES STEEL

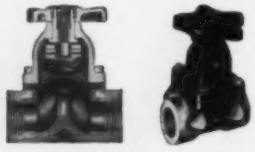
FOR HOT CORROSIVES:
ACE TEMPRON

Heat-resistant nitrile hard rubber pipe handles inorganics at 250-275 deg. F. . . also resists wide range of organic chemicals at room temperature. Sizes 1" to 8". *Bulletin 96-A.*

Only the Right piping can deliver a "GOOD RUN"

For profitable runs you must keep equipment "on stream" full time with no corrosion shut-downs. Protect your profits with Ace piping, pumps, valves, and tanks. Many rubber and plastic materials . . . backed by a century of chemical experience. Get facts today from American Hard Rubber Company.

VALVES
for all-plastic piping systems



Trouble-free plastic diaphragm valves . . . choice of general-purpose ACE-ITE, ACE PARIAN (polyethylene) or ACE SARAN. Handles most corrosive chemicals and food ingredients. Sizes ½" to 2", 50 psi. at 77 deg. F. *Bulletins 80 and 351.*

RIGID VINYL . . . STRONG. AGE-PROOF

ACE RIVICLOR is a new rigid threaded plastic pipe with good aging and high impact strength. Not affected by most inorganic acids and alkalis, also excellent for many organics. Sizes ½" to 4". *Ask for Bulletin CE-56.*

TOUGH ACE-ITE PLASTIC PIPE

General-purpose moderately priced rubber-plastic pipe handles most common chemicals to 170 deg. F. . . . except few strong acids and organic solvents. Tough, odorless, tasteless. Rigid pipe ½" to 6". *Bulletin 80.*

STAYS TOUGH AT SUB-ZERO TEMPERATURES

ACE PARIAN . . . odorless, tasteless, rigid polyethylene. Best chemical resistance of any plastic at room temp. except to acetic acid. Excellent impact strength at sub-zero temp. Rigid pipe ½" to 2". *Bul. 351.*

ACE processing equipment of rubber and plastics

AMERICAN HARD RUBBER COMPANY
Ace Avenue • Butler, New Jersey
DIVISION OF AMERACE CORPORATION
For more facts circle 616 on Reply Card

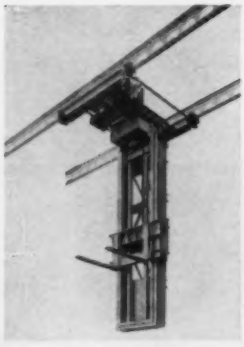
NEW PRODUCTS

(Begins on page 172)

register is of set back type, but all are contained within the cabinet, and when a bin is refilled, the counter may be returned to zero, if desired. Richardson Scale Co.

50—OVERHEAD FORK LIFT is heavier, more versatile

Maneuverability is a feature stressed for this improved fork lift. When used on manufacturer's tramrail crane, it can be traveled to front, rear or either side of a building, up, down and turned through a circle, clockwise or counterclockwise. It is reported particularly advantageous for handling



and storing materials in warehouses—materials can be piled higher and aisleways reduced in width. Operator of the lift has full vision for all positions of his work, it is noted, and he can operate the unit at a safe distance from the load. These forklifts are available for various capacities and lifts, and can be supplied with all motions motorized or manually operated, or any combination. If not required, rotating motion can be omitted. Units can be telescoping type (as illustrated) or non-telescoping. Forks are adjustable to accommodate width of materials handled and can be furnished to serve both sides of an aisleway for non-rotating type fork lifts. Cleveland Tramrail Div., The Cleveland Crane & Engineering Co.

51—FLOORING comes in range of colors, formulations

Selbalith, a tough, trowel-applied composition flooring material is available in nine colors and more than 40 formulations—the latter offering compressive strength ranges from 4800 to 6000 psi. The material is described as a long-wearing, laboratory-controlled formulation of magnesium oxychloride cement, economical for new installations as well as for resurfacing old

Type 631-BL

STROBOTAC®

Range: 600-14,400 rpm direct reading, useful from 60-100,000 rpm.

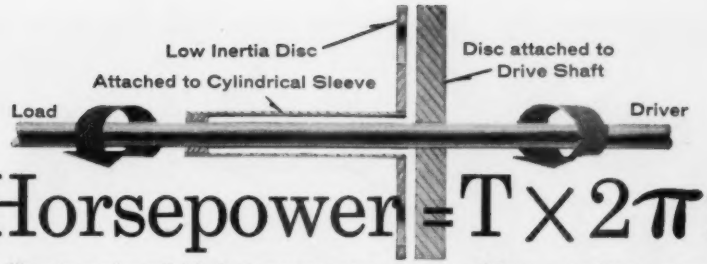
Accuracy: ±1% of dial reading over most of the range.

Flash Duration: 10-40μsec.

Power: Operates from normal 115v, 60-cycle lines.

Portability: 7⅛ x 9 x 10 inches, 9½ lbs.

$160.



Horsepower = T × 2πn

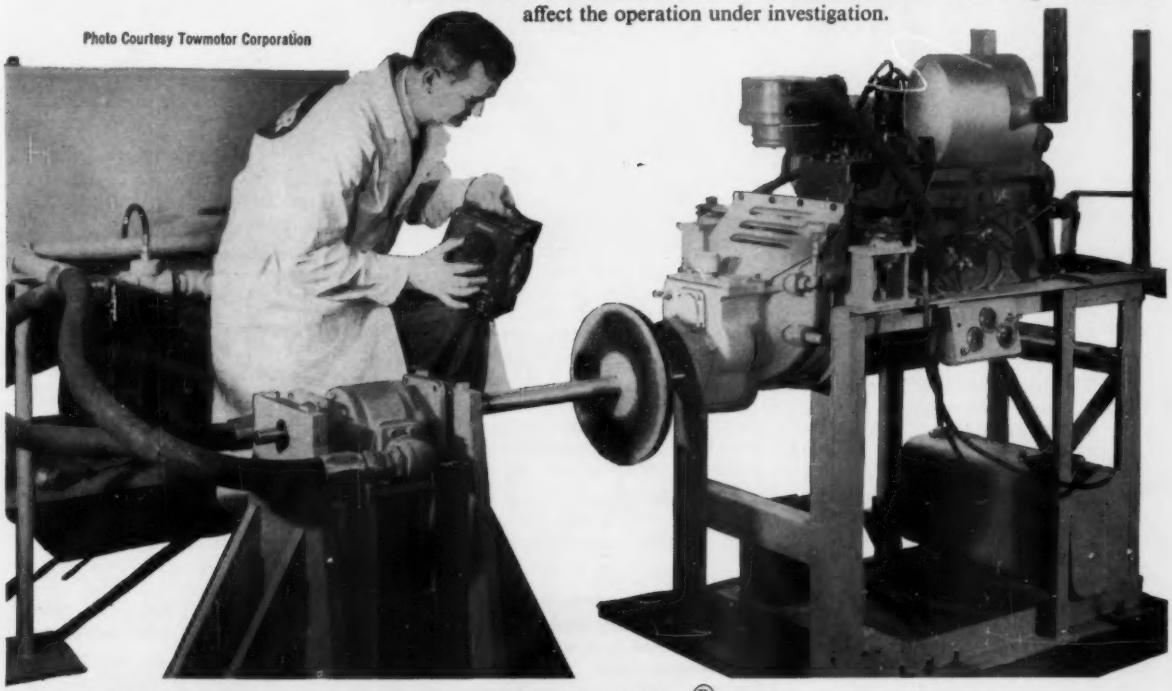
How to make reliable horsepower measurements without resorting to expensive equipment? This is a problem that confronts many engineers. The Towmotor Corporation of Cleveland utilizes a fundamental physical principle and the G-R Strobotac to perform this work.

Measurement of engine horsepower is accomplished with a hydraulic power-absorption stand and the G-R Strobotac. Fitted concentrically over a drive shaft is a cylindrical sleeve that has a low-inertia disc at one end and is attached to the drive shaft at the other end (see sketch). Parallel to the low-inertia disc and securely connected to the drive shaft is another disc.

When the driver is operating, the drive shaft twists and there is a relative displacement between the two discs that is proportional to the TORQUE applied. However, since the whole assembly is whirling around, little can be seen. It is necessary to "stop" the motion to determine the displacement — this is done accurately and conveniently with stroboscopic light, supplied by the Strobotac. This instrument simultaneously gives the SPEED of the rotating shaft on its calibrated dial. Since HORSEPOWER is proportional to the product of TORQUE and SPEED, the job is done.

The G-R Strobotac is ideally suited for this type of work or, for that matter, for *any* measurement of speed of rotating, reciprocating, or other cyclic motion. The instrument is an ideal design, production, or maintenance tool. Its high-intensity, short-duration pulses of light "freeze" rapidly moving parts or processes, making possible detailed examination of the action while at full speed. There is no physical connection between Strobotac and the device under test — no drag whatever to affect the operation under investigation.

Photo Courtesy Towmotor Corporation



STROBOTAC®

Manufactured Exclusively by

GENERAL RADIO Company 275 Massachusetts Ave., Cambridge 39, Mass.

Broad Avenue at Linden, Ridgefield, N. J. **NEW YORK AREA** 1000 N. Seward St. **LOS ANGELES 38**
8055 13th St. Silver Spring, Md. **WASHINGTON, D. C.** 1150 York Road, Abington, Pa. **PHILADELPHIA**
1182 Los Altos Ave., Los Altos, Calif. **SAN FRANCISCO** 6605 W. North Ave., Oak Park, Ill. **CHICAGO**
In **CANADA:** 99 Floral Parkway, **TORONTO 18**

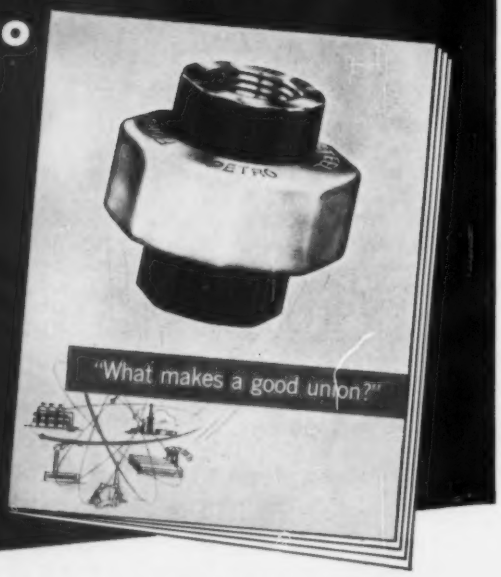
All G-R Products are now covered by a *2-Year Warranty*

For more facts circle 617 on Reply Card

NEW... for the first time...

A GUIDE TO HELP YOU SELECT BETTER UNIONS

Here's a 16-page HANDBOOK that gives facts and tells...



THE IMPORTANT THINGS YOU NEED TO KNOW ABOUT UNIONS

PRESSURE-TIGHTNESS comes when the seats are properly mated. "What Makes a Good Union" tells you how this is done.

DURABILITY reduces service and operating costs . . . saves money. This new handbook gives you the facts on this.

These and other important features of good unions, such as safety in handling, speed in making up, and individual factory testing, are clearly illustrated and discussed in "What Makes a Good Union."

Clayton Mark pioneered unions – produced the first *steel* union, the first forged *stainless* steel union, the first handle-bar union, the first orifice union, and originated many features which today make unions so trouble-free, long-lasting, and economical.

The high points of this wealth of practical experience provide a liberal education in unions for contractors, piping superintendents, steam-fitters, maintenance men, and purchasing agents. "What Makes a Good Union" is a trouble-shooter's handbook and an excellent text book for training new men.

BE SURE TO WRITE FOR YOUR *FREE* COPY OF "What Makes a Good Union" so you'll have at your fingertips the useful, money-saving information contained in this easy-to-understand handbook.

CLAYTON MARK & COMPANY

Since 1912

Originators and Manufacturers of STEEL UNIONS

Look for these Clayton Mark brand names:

PETRO • HYDRO • MARK • ORIFICE HANDLE-BAR

USE THIS COUPON TODAY

CLAYTON MARK & COMPANY
1900 Dempster Street
Evanston, Illinois

Please send FREE copy of "What Makes a Good Union."

Name_____

Company_____

Address_____

Town_____ Zone____ State_____

For more facts circle 618 on Reply Card

NEW PRODUCTS

(Begins on page 172)

floors. It can be applied over wood, concrete or steel. Anchoring is by use of mechanical bonds, such as wire or expanded-metal lath, by roughing the surface, or by a latex binder. Pigments used in the colors are an integral part of the mix and are dispersed throughout the thickness.

Manufacturer says that Selbalith offers a slip-resistant surface, and although hard enough to withstand trucking without indenting, is sufficiently resilient to stand on without causing fatigue. It is explained that this is due to the fact that Selbalith, although stronger than concrete, contains various fibrous materials which give it resilience and flexibility. Selby, Battersby & Co.

52—PACKAGED BOILER for processing plants

The Monitor is a compact packaged boiler (the 40-hp size is only 53 in. high) designed to bring large boiler industrial quality to small and medium sized processing plants. It is fully automatic in operation, and needs no chimney; a simple vent removes any combustion gases from the boiler room. The Monitor is available through 60 hp or 2070 lb of steam per hour and can be fired with oil or gas or furnished with a combination burner. Manufacturer points out that it is factory assembled and complete, including insulation and metal jacketing. Cleaver-Brooks Co.

Use the Reader Service Cards provided on pages 237-238 to ask for more information on these products. Circle item numbers of products in which you are interested.

53—35mm CAMERAS with exposure value system

Four miniature cameras are introduced to meet many industrial snapshot needs. According to manufacturer, these cameras are so simple to use that anyone can use them to obtain color slides and black and white prints. The cameras utilize an "exposure value system" designed to assure clear and sharp pictures. They come equipped with a set of seven EVS cards, each designating best settings to be used with a particular type of film under varying light conditions or with flash. The cards slip on the back of the cam-

Easy does it!

with P&H Electronic Crane Control

Precise spotting of giant loads is far easier if you're using P&H Overhead Cranes equipped with P&H electronic "stepless" control.

This remarkable control makes possible an infinitely variable power application from no-load to full-load by providing a smooth "stepless" control response. As a result, tremendous loads can be spotted with exceptional accuracy — without the strain of a jerky "inching" operation.

P&H Electronic Crane Control helps reduce crane maintenance, too. It is a simple wiring circuit, yet it replaces 29 sets of contactors — points of heavy wear — found on other cranes.

Investigate this outstanding advance in overhead cranes! Write for "Electronic Crane Control" to Dept. 108C, Harnischfeger Corp., Milwaukee 46, Wis.

HARNISCHFEGER

P&H INDUSTRIAL DIVISION
MILWAUKEE 46, WIS.

For more facts circle 619 on Reply Card

WOW...

Set a ¼" stud in steel or concrete with one light tap!

ONLY

$39.95

NEW Remington "Mighty-Mite" STUD DRIVER

HERE'S the new handy-sized cartridge-powered Remington stud driver that handles all fastening jobs requiring a ¼" stud. "Mighty-Mite" sets a stud a minute—with no pre-drilling or outside power required, and it's yours for only $39.95.

"Mighty-Mite" is compact and easy to operate. Simply unscrew the upper assembly, insert the 22 caliber cartridge with the desired ¼" stud, and you're ready to anchor wood sections or steel fixtures to concrete or steel! One light tap of a hammer or mallet on the firing pin and your stud is set firmly in place, straight as an arrow.

We have all the facts about the new Remington "Mighty-Mite" in an illustrated free booklet. Included are many applications, with pictures, of this versatile stud driver that pays for itself in just a few fastenings. Send for your copy today by mailing the coupon below.

Model 455A Remington Stud Driver—medium and heavy-duty companion tool to the low-cost "Mighty-Mite."

Remington

DUPONT

Industrial Sales Division, Dept. 1312
Remington Arms Company, Inc.
Bridgeport 2, Conn.

Please send me your free booklet which shows how I can speed the job and save with the new Remington "Mighty-Mite" Stud Driver.

*Name*_____ *Position*_____

*Firm*_____

*Address*_____

*City*_____ *State*_____

For more facts circle 620 on Reply Card

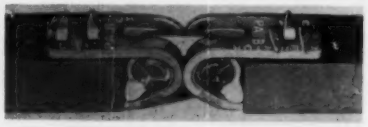
NEW PRODUCTS

(Begins on page 172)

era for easy reference. The EVS number is a combination of the two elements that determine how much light falls on the film: shutter speed and opening of the lens diaphragm. In the simplest of the new cameras, there's a fixed speed shutter and the EVS setting changes only the lens opening. The other three offer several combinations of lens opening and shutter speeds that add up to the same EVS number. This lets you work for one or two goals: fast shutter speed or increased depth of field. The cameras range in price from less than $27.00 to around $83.00. Eastman Kodak Co.

54—V-BELT FASTENERS come in two types

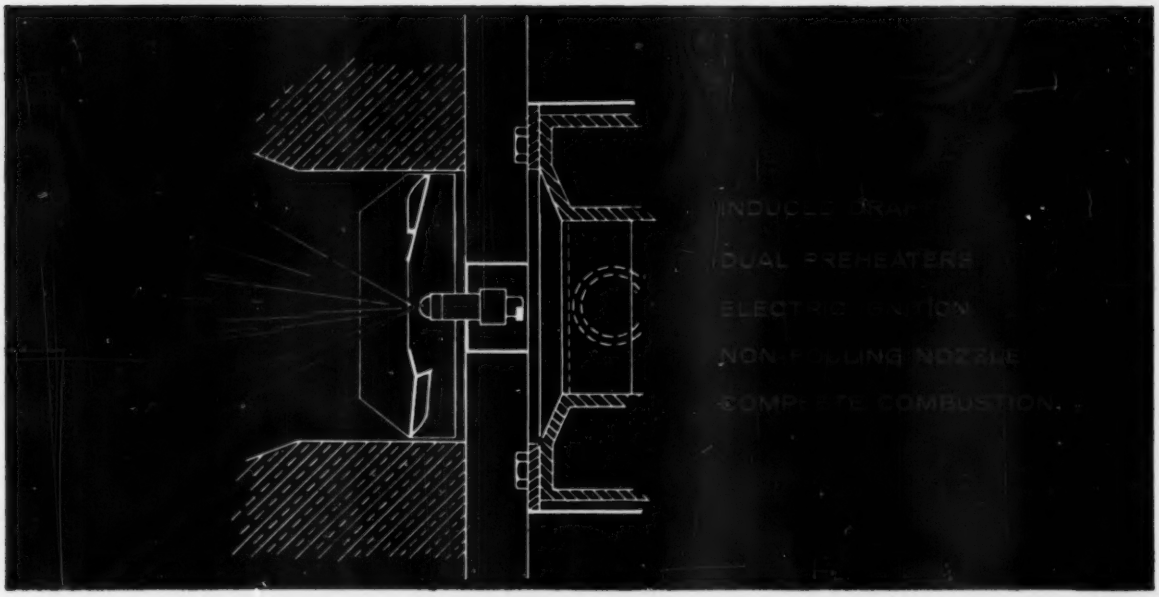
Alligator Aluminum End Plate Fasteners, of strong aluminum alloy, are announced for high speed drives. Because these fasteners are designed to reduce the whip of the belt, when belt



speed is in the higher range, the internal working parts have longer life, it is pointed out. Another recent development by this manufacturer are permanently assembled fasteners, shown. When a separate joint is not required, Alligator PA "B" and "C" Fasteners are reported to work well. The working parts of the fastener are locked in place by a special forming of the end plate. When permanently assembled fasteners are used, the rocker pin tool set, ordinarily used for assembling fastened V-belts, is not needed. Flexible Steel Lacing Co.

55—ADJUSTABLE VALVE is packless, resists corrosion

Improved control of unit conditioners, unit ventilators, and convectors is said to be provided by the 4-in. Powertop. Features incorporated in this pneumatic valve are designed to increase its adaptability, accuracy and life. Foremost among them is an externally adjusted and easily accessible Monel spring with a 5 psi range. It may be adjusted to close between 5 to 12 psi top pressure to enable a single valve to meet a variety of conditions. Lower housing of the valve is of high impact phenolic to eliminate electrolytic corrosion between housing and internal



NEW PYROJET BURNS NO. 5 OIL WITH GUARANTEED EFFICIENCY

If your facilities are designed for No. 5 oil, Dravo's new *Counterflo* Space Heater with PYROJET burner will handle all grades of No. 5 oil efficiently and dependably. The dual pre-heating system brings hot oil out to the tip of the nozzle. Simplified electric ignition system provides smooth, dependable starts. With burner efficiency guaranteed for all grades of No. 5, a new level of heating economy is available.

Dravo Space Heaters with induced draft PYROJET burner are also available in gas or gas/light oil burning models. New stainless steel air-foil combustion chamber raises heat transfer efficiency. Ask your Dravo representative for expert advice on your heating problem, or write Dravo Corporation, Dravo Building, Pittsburgh 22, Pa.

DRAVO

CORPORATION

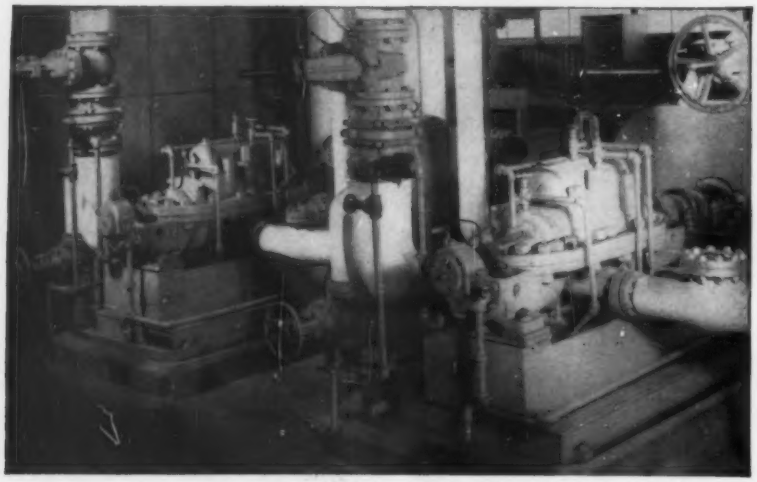
GET ALL THE FACTS ON LOW COST HEATING—WRITE FOR BULLETIN 564...

Blast furnace blowers • boiler and power plants • bridge sub-structures • cab conditioners • docks and unloaders • dredging • fabricated piping foundations • gantry and floating cranes • gas and oil pumping stations • locks and dams • ore and coal bridges • process equipment • pumphouses and intakes • river sand and gravel • sintering plants • slopes, shafts, tunnels • space heaters • steel grating • towboats, barges, river transportation

For more facts circle 621 on Reply Card

PRODUCTION CONTINUITY

Begins in the Boiler Plant



Warren Six Stage Boiler Feed Pumps installed at a Southern Board and Paper Mill.

Boiler Feed Pumps may look much alike, type for type, but it is well to keep in mind such intangible factors as:

- Experience and integrity of the manufacturer
- Dependability of product
- Know-how, Workmanship, Service
- Maintenance and Repairs
- Lost production due to down-time
- Early replacement because of "tight" original recommendations

It is impossible, of course, to get these items into your "specs," or the supplier into his "quotes," but don't overlook their importance with relation to price, possible future requirements and *production continuity*.

P-34

WARREN

SEND FOR FREE BULLETINS

WARREN PUMPS, INC.

WARREN MASSACHUSETTS

For more facts circle 622 on Reply Card

NEW PRODUCTS

(Begins on page 172)

metal parts and to resist heat distortion over 300 F. The silicone diaphragm is 10 sq in. in area, providing greater closing power than previous models of the valve. The diaphragm housing is lower, enabling the valve to fit into a smaller space.

Also new in the valve is a molded swivel (poppet) and a stem guide with two bearing points to provide perfect alignment in the valve seat and tight shut-off, and to prevent noise or "chattering" at differential pressures to 25 psi. The valve utilizes company's duo-seal construction. Instead of packing, the valve uses a seamless bronze bellows as a primary seal and a spring-loaded Neoprene quad ring as a secondary seal. Further details are in Form P-55. Powers Regulator Co.

56—FOOTLESS DRIVE UNIT for rugged industrial duty

Type VEV Varidrive is a compact, footless variable speed motor with NEMA Style C or P face-type mounting. It is reported to feature quick, accurate alignment to driven equipment. Versatility of this type of mounting suggests use of the Type VEV for turbine pumps, mixers and similar applications. The unit is designed for rugged duty and is available from ¼ to 30 hp, in ratios up to 10:1 and can be had with Varitrol automatic control or remote controls of the mechanical or electrical type. U. S. Electrical Motors Inc.

57—RUNNERS make racks out of pallet shelves

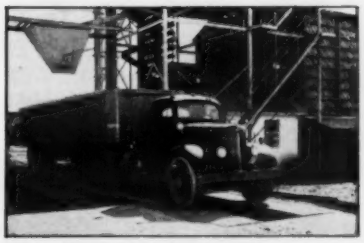
These adjustable skid runners enable conversion of conventional pallet storage shelves into temporary or permanent skid storage racks. The runners are adjustable sideways, and its pointed out that they cannot fall out or move backward or forward because flanges at both ends fit over shelf stringers. Manufacturer suggests that since the flexibility feature of the

PLEASE, DON'T HANDLE THE MERCHANDISE!

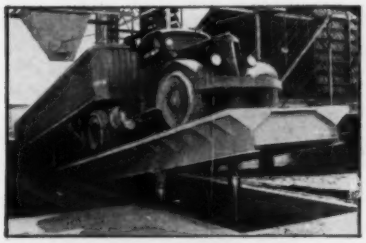
by **ANDREW T. BROWNE**
Chief Engineer, Globe Hoist Company

One of the major costs in a manufacturing operation is the handling of materials . . . picking them up, moving them from one place to another, then setting them down again. These steps often amount to from 20% to 50% of the direct labor charge! A careful study of your costs for handling materials around your factory will give you this answer: **"DON'T HANDLE THE MERCHANDISE!"** Proper handling equipment usually can reduce your costs substantially.

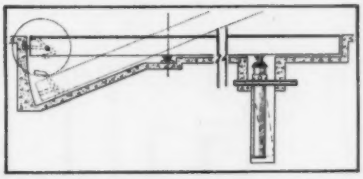
Unloading a truckload of oranges in a matter of seconds not only saves valuable time, but also delivers the fruit, untouched and unharmed, to the head of the processing line at Food Industries, Inc., Cocoa, Florida. A Globe hydraulic-powered tilting platform lift makes this possible.



ALL SET? Fruit-loaded tractor-trailer is positioned on platform of tilting-lift. Wheel chocks are in place.



AWAY THEY GO! With lift tilted to 20° incline, oranges spill gently out the back onto a moving conveyor belt.



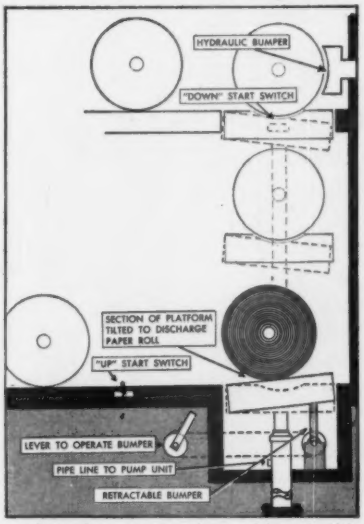
This is the orange-dumping installation shown above. Two hydraulic power cylinders are operated by Globe Electric Oil Pump controlled by weatherproof "holddown" type pushbutton. Note fulcrum is established one-third of distance from rear, permitting cargo to spill with minimum amount of fall, at the same time reducing power necessary to tilt the platform.

Similar Globe installations have solved many problems involving the discharging of cargo quickly from trucks, trailers, hoppers and other portable containers. Globe has developed a complete line of tilting devices designed to perform this and many other functions.

For example, the installation illustrated below replaced a crude, antique winch and cable used to position a high-sided, roofed ramp. Through this, pigs were transferred from the rail terminal to any one of three deck levels of a trailer.

The same 25 foot ramp is now power-positioned by means of a Globe oil-hydraulic cylinder and electric oil pump unit. Wheels at discharge end compensate for height differential. Measured by its "pigs-per-minute" rating, this installation has done much to simplify stock-handling operations and has more than paid for itself with savings in both time and money.

Another typical time- and money-saving Globe installation involved the use of automatic controls. The problem was to move one-ton rolls of paper from an upper floor to the lower shipping level 11′6″ below. A Globe platform lift, equipped with completely automatic controls, solved the problem.



Complete automation achieved with two limit switch controls. An electric oil pump unit powers the 8⅝″ diameter power cylinder.

The advantages of tiltable superstructures in materials-handling operations are many — the results to be obtained from installing Globe Ramps, Hoists, or Lifts are usually the same . . . increased productivity, higher profits for the operation of which they are a part.

With just a few pennies a day from these additional profits, you can pay for your installation through Globe's Time Payment Plan . . . pay for it, while you use it, from the money it saves.

Globe manufactures the World's Most Complete line of Industrial Lifts and Automotive Hoists. Send for a Catalog describing the Globe Lift that will do the best job for you.

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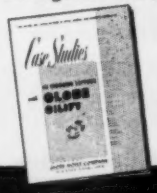


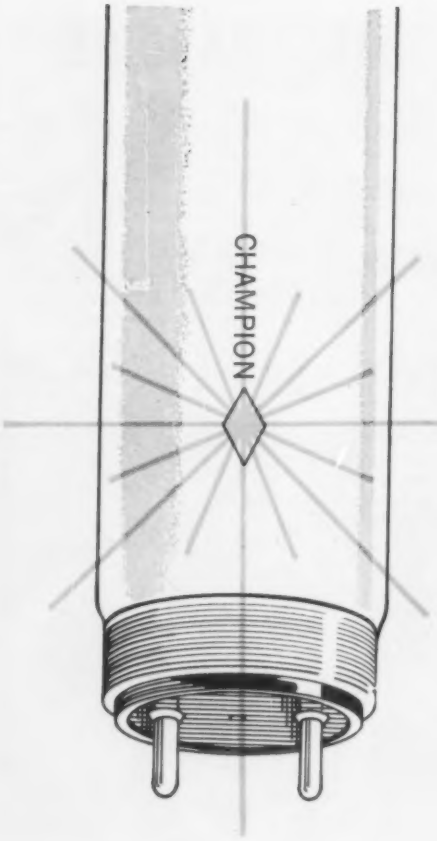
GET YOUR FREE COPY TODAY!

GLOBE HOIST COMPANY PE-814-L
East Mermaid Lane at Queen Street
Philadelphia 18, Pennsylvania

Please send me detailed information on Globe Hoists for .....
(describe application intended)

NAME.....
COMPANY.....
ADDRESS.....
CITY..... **STATE**.....

For more facts circle 623 on Reply Card



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CHAMPION LAMP WORKS
LYNN, MASSACHUSETTS
A Division of Consolidated Electric Lamp Co.

MILLIONS OF LAMPS A YEAR . . .
ONE PLANT Standard of Quality Control

For more facts circle 624 on Reply Card

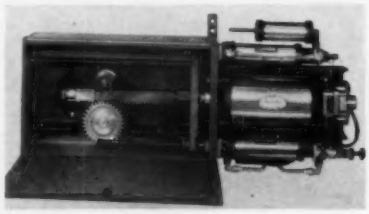
NEW PRODUCTS

(Begins on page 172)

runners permits storage of skid loads on any pallet rack, they may, in some cases, eliminate extra cost of conventional skid storage racks. Hartman Metal Fabricators, Inc.

58—POWER FEED for multiple drilling applications

Hy-Torque is announced as a rugged, complete heavy duty unit designed primarily to power the feed on multiple drilling applications. The basic unit consists of a steel gear rack which drives a pinion gear mounted on a



shaft with a hub as the drive unit. The 3000 in.-lb maximum torque delivered at the hub may be applied to cross-feed or driven shaft for rotational or linear movement. Four standard models provide a choice of degree of rotation of the 4-in. pitch diameter pinion gear: 170, 255, 340 or 425 deg. A 4½-in. bore air motor advances gear rack with a thrust of 15 times applied air line pressure. Two Hydro-Checks govern feed rate and serve to balance the hydraulic reaction during the feed portion of the stroke. Hy-Torque will operate on any air pressure between 15 and 150 lb; units are available for line or low voltage use. The Bellows Co.

59—BUILDING BOARD is lightweight, incombustible

Asbestolux is composed entirely of inorganic material and therefore is resistant to fire, heat, rot, mold or vermin, maufacturer states. The material is formed of a long fiber asbestos known as Amosite which is bonded chemically with silica in a high pressure steam process. The resiliency, strength and length of the asbestos fibers in the material contribute to its lightness and workability. Asbestolux is also claimed to be a prime insulating material, thermally and electrically. It serves as a thermal barrier for processes involving intense heat and its high dielectric strength suggests its use both as an electrical component and as a protective material for electrical processing. Reportedly

News about HYPALON®

HYPALON doubles service life of belt carrying salt at 302° F.

An elevator belt, with cover made of Du Pont's new synthetic rubber HYPALON, has twice the life span of the best rubber belts that had been used at a large chemical plant. The bucket belt—operating 80 hours a week—lifts hot salt from a rotary drying kiln to a loading platform. Average temperature of the salt is 302° F.

The elevator belt with covers of HYPALON lasted six months—twice as long as rubber belts which would get brittle and crack.

HYPALON synthetic rubber has many excellent properties which help reduce your maintenance and replacement costs. Just fill out the coupon for more details.

Elevator belt with covers of HYPALON resists extreme heat of hot salt.

HYPALON *is a registered trademark of E. I. du Pont de Nemours & Co. (Inc).*

How neoprene-jacketed cable protects Capital Airlines maintenance shop

There may be gas vapors in this wing tank. So in Capital Airlines maintenance shop all electric cords are jacketed with neoprene for safety.

Contact with chemicals doesn't weaken cords

Capital Airlines leaves nothing to chance in its maintenance shop. For safety's sake, cables on all portable tools and trouble lamps are jacketed in neoprene.

"These cords are used inside wing tanks and parts of the fuselage where gas vapors sometimes accumulate," says C. F. Schaub, Capital Airlines Safety Director. "It doesn't take much imagination to guess what would happen if a cord shorted inside a gas tank. That's why we must use the very safest—neoprene-jacketed cable.

"The cords frequently come in contact with gasoline, cleaning compounds, paint thinner, acetone, hydraulic and lubricating oils which weaken other cord sheaths badly . . . weak spots that can lead to shorts . . . and trouble."

Mr. Schaub's experience with neoprene parallels the experience of engineers who have utilized neoprene's unique combination of properties for protective coatings, hose, gaskets, belting and other maintenance items.

Resistance to oils and chemicals, heat, sunlight and weathering, flex cracking, abrasion and cutting, oxidation and aging—*all* combined into *one* resilient material—makes neoprene a wise choice for years of problem-free service. Just clip the coupon for more information on how neoprene can work for you.

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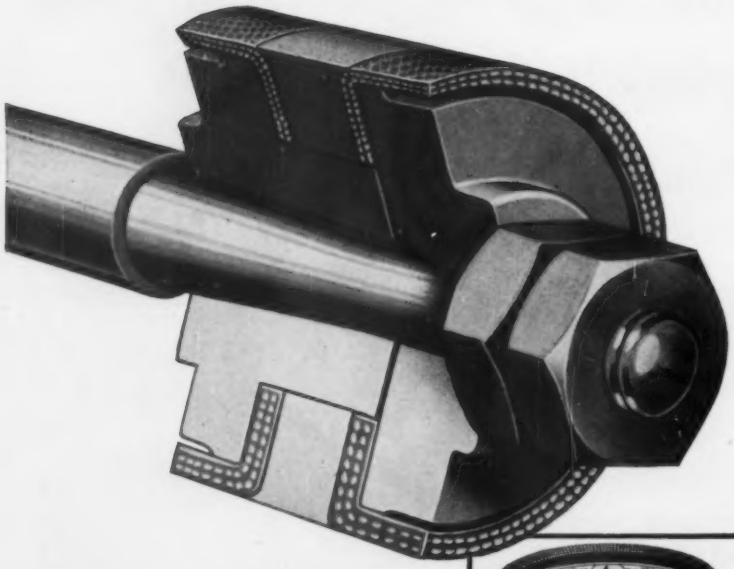
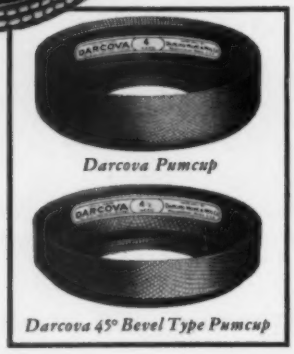


WHY PUMCUPS MAKE A DIFFERENCE



Darcova Pumcup

Darcova 45° Bevel Type Pumcup

- **in reciprocating pumps**
- **in air and hydraulic cylinders**

With Darcova Pumcups in your cylinders, there's less fluid slippage. High volumetric efficiency is maintained and Pumcups outlast other packings at least 3 to 1! There's less down-time! Lower power cost! Smoother operation! Less maintenance and replacement!

Longer life is the result of truly advanced cup engineering, including 100% nylon composition, plus a choice of types, textures and precision sizes to exactly match fluid, cylinder, pressure and temperature conditions.

These same factors contribute to prolonged high efficiency by permitting full advantage of the "cup principle". Thus fluid pressure always keeps Pumcups snug against cylinder wall, despite eventual wear, while the total frictional load is minimized.

Send for Bulletin 5503. It will give you *all* the facts.

DARLING VALVE & MANUFACTURING CO.
Williamsport 14, Pa.

DARCOVA
THE ORIGINAL COMPOSITION CUP

TRADE MARK PUMCUPS

For more facts circle 626 on Reply Card

NEW PRODUCTS

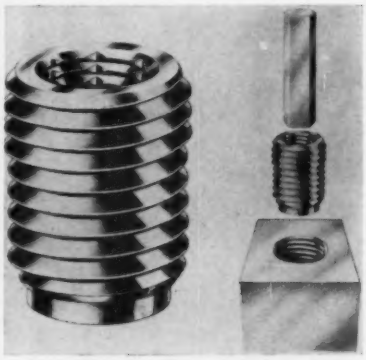
(Begins on page 172)

one-third the weight of good quality cement asbestos boards and five times greater in insulating value, Asbestolux can be sawed, nailed or screwed. North American Asbestos Corp.

It's easy to obtain product data with the postage-free Reader Service Cards provided on pages 237-238. Use them for information on advertised products, too. Just circle the key number appearing at bottom of the ad.

60—STEEL INSERT solves some installation problems

Inserto U-Tap is an internally and externally threaded steel insert that locks itself into the parent material at specified torque levels when driven, it is announced. The internal threads are hexagonally through-broached the



entire length of the insert to accommodate a hex-drive bar. This hex-bar is the only implement needed to drive the insert and it can be used in any hand power tool. Tests are reported to show that the strength of the internal thread is not reduced by the broaching operation. Inserto-U-Tap has standard form threads and is installed into a standard Class 3 tapped hole. A pilot is provided on the lower end of the inert to pre-align parts with tapped holes when automatic feeding devices are utilized. Rosan Inc.

61—FLOOR CLEANER can be used on walls, too

Finorclean is announced as a nonflammable cleaner or all types of floors, including wood, concrete, linoleum, rubber tile, asphalt tile, terrazo, asphalt and cement, as well as for walls, painted surfaces and metal trim. Finor-

collect more dust for fewer dollars!

New 16-page booklet gives all the facts on AAF's improved Type W ROTO-CLONE

Here are the facts on the very latest improvements in AAF's Type W ROTO-CLONE—the "hottest" wet dust collector in industry since 1937. This 16-page booklet is chock full of data on arrangements, dimensions, performance characteristics, engineering data, and humidifying action.

The distinguishing feature of the Type W is the addition of water sprays to the basic principle of dynamic precipitation. This results in collection of even the lightest and finest dust particles and delivers collected dust in a slurry for easy disposal.

Get all the facts. Send this coupon today!

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Please send me Bulletin 274B which describes AAF's wet-collecting Type W ROTO-CLONE.

Name_____

Company_____

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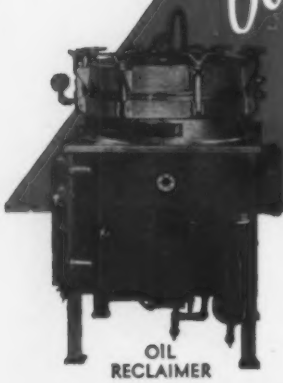
HILCO OIL RECLAIMERS

REMOVE WATER, SLUDGE, ACID

for complete

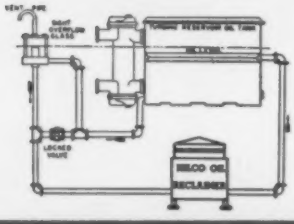
TURBINE OIL CONDITIONING...

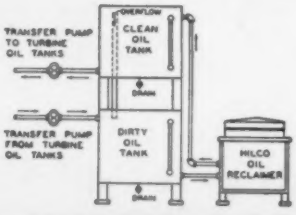


OIL RECLAIMER

The HILCO Turbine Oil Reclaimer is a self-contained, compact unit that will produce and maintain oil free of all solids, sludge, acids, moisture and air, keeping the oil in first class condition. Its purifying process is a continuous, all electric, automatic operation, requiring infrequent attention. It removes contaminants as fast as they are formed, maintaining lubricating oil at full value of new oil. HILCO Oil Reclaimers will also purify compressor, hydraulic, insulating, Diesel and gas engine lube oils.

Purifies Turbine Oil by Continuous or Batch Purification . . .





A continuous, direct-connected, foolproof oil reclaiming system. Oil flows from turbine reservoir thru to sight overflow glass, to HILCO Oil Reclaimer, and back to reservoir.

A batch system designed to serve one or more turbines when it is desired to withdraw all the oil from reservoir for complete periodic batch reclaiming to restore all oil as good as new.

WRITE FOR THIS FREE BOOKLET TODAY . . . FOR MORE INFORMATION ON HILCO TURBINE OIL RECLAIMERS

THE HILLIARD Corporation

181 W. FOURTH STREET ELMIRA, N. Y.

"IN CANADA: Upton-Bradeen-James Ltd., 890 Yonge St., Toronto; 8760 Verville St., Montreal

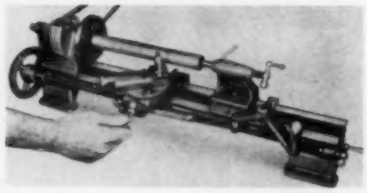
NEW PRODUCTS

(Begins on page 172)

clean is fast and economical to use, says manufacturer, and is a liquid concentrate which removes dirt, grease oil, and wax. It is described as odorless and containing no abrasives, acids or solvents. A sample of Finorclean is offered to qualified plant engineers. Fine Organics, Inc.

62—BENCH ENGINE LATHE is small, rugged unit

The Little Giant is a bench engine lathe announced as capable of precision work on metal, wood, and/or plastics. Although small and compact (bed length 30 in., cutting range 20



in., and swing 7 in.), the Little Giant is said to be of rugged production design and steel construction and built to do work comparable with that of larger lathes. Power requirements are ¼ hp at 1750 rpm. Featured is a three-speed pulley. The Little Giant has bed ways machined with double Vs to 60 deg, its compound swivels 360 deg on a center pilot and is locked with two T-slot bolts. A hollow tapered drive shaft accommodates boring tools, tapering cutters. List price of the lathe is around $100 with two male and two female centers, face plate driving dog, cutting tool and an armature driving dog. King Corp.

63—SELECTOR VALVE for switching liquid flow

For automatically switching the flow of liquids, under pressure from one tank to another or from a series of tanks to processing, this simple valve can be inserted in lines where tanks are equipped with individual pumps or where the pressure through gravity permits. It is designed to direct the flow of liquid from one or all tanks at the same time and to seal off the empty one when operating from all tanks. When feeding from one tank at a time, the valve frees an operator from watching gages and tanks as critical low points are reached, company points out; he can throw a full tank in any time before this point is reached. Both tanks will feed liquid until the first runs dry, at which time

For more facts circle 628 on Reply Card

Hall Industrial Water Report

VOLUME 5 DECEMBER 1957 NUMBER 6

Keep Water Out of Steam

Water belongs in the boiler or evaporator, not in the steam. Wet steam from priming or foaming of boilers may seriously damage superheaters or turbines. Evaporator vapor of poor quality introduces excessive amounts of solids to the boiler feed cycle.

Carryover problems can be solved. Mechanical changes may be the most economical answer. Perhaps the water level should be lowered, or its variation controlled more carefully, or maybe the baffles in the steam drum should be altered. But the problem may be a chemical one. Is there unsuspected contamination of condensate or feedwater? Or is the answer simple adjustment of blowdown or use of an effective antifoam? Hall engineers are experienced in searching for the best way to avoid wet steam. They stand ready to help you.

More Blowdown

A Georgia plant, plagued with gross carryover from a small HRT boiler, had tried unsuccessfully to solve the problem with a number of compounds offered as effective cures. Usually the compounds aggravated the condition. Finally, Hall Laboratories was called in to help.

Hall field engineer John Kenney quickly diagnosed the problem. Little attention was given to blowdown of the boiler, so the total solids in the boiler water frequently ran much too high. After Kenney gave the operators the proper test procedures to control boiler water conditions and trained them to maintain total solids concentration at a satisfactory level, the difficulty was completely eliminated.

Simple, wasn't it? But only after a Hall engineer applied his training and experience to finding the actual cause of the carryover.

Dye Bath Trouble

In spite of heavy blowdown, careful control of boiler water conditions and normal boiler steam loads, a New England finishing plant experienced serious difficulty in dyeing operations because of impure steam. Conductivity tests on samples of condensed steam from the bleach house showed continuous carryover with dissolved solids ranging from 14 to over 300 ppm.

There was little if any room for improvement in boiler water conditions. There was no detectable contamination of boiler feedwater that could easily be eliminated. There was no simple mechanical solution to the problem. Hall field engineer Bob Dow decided accordingly to feed Hagan C-1 Antifoam. Carryover stopped immediately. Conductivity tests on samples collected under the same conditions as before showed only a trace of dissolved solids.

Further work indicated that with the use of the antifoam, blowdown could be cut in half with savings in water and chemicals. Needless to say, plant management is happy with Hall Laboratories service.

Hammers Stopped

The makeup water which constitutes about 70 percent of the feedwater at a forge plant in California contains 325 ppm hardness and 800 ppm dissolved solids. In addition, the condensate available and the exhaust steam used for feedwater heating are heavily contaminated with cylinder oil.

When Hall field engineer Dick Carey tackled the job he found boiler water level fluctuating badly and so much water in the steam that the continual stopping of the forging hammers was seriously interfering with production.

The only change that could be made at once was the feeding of Hagan H.P. Antifoam. This turned out to be all that was necessary. The water level stopped fluctuating, carryover ceased and so did any difficulty at the hammers.

Water is your industry's most important raw material. Use it wisely.

Foaming Traced to Size

During a regular visit to a New York paper mill, Hall field engineer Lou Eppelsheimer was informed that water was foaming in a condensate pump and that a heavy deposit had built up on a turbine throttle valve in a week's time.

Subsequent analysis showed the condensate to have a high pH value and to contain raw water, considerable silica and much organic matter. The deposit on the turbine throttle contained boiler water salts, indicating carryover. A most significant clue was that the foaming condition occurred only on Mondays.

With this information as a guide the plant men and the Hall engineer were able to pinpoint the difficulty. In the plant, the size emulsion was prepared with raw water, a silica compound and glue. The hot mixture was transferred from one tank and atomized into others with a steam injector. When steam pressure dropped over weekends the emulsion was sucked back into the steam lines. As operations were resumed on Monday, the contamination was flushed through the traps into the condensate return system.

Suitably placed check valves and regular examination of condensate have eliminated all difficulty.

Dr. Partridge Honored

When industrial water was selected as the 1957 topic for the Annual Marburg Lecture of the American Society for Testing Materials, Dr. Everett P. Partridge, Director of Hall Laboratories, was chosen as the lecturer. At the ASTM meeting in June, Dr. Partridge showed where we stand as a nation with respect to what he called "Your Most Important Raw Material." Reprints of his lecture will be available.

Industrial Water Problems Require Special Handling

There are no "stock answers" to industrial water problems. For information write, wire or call Hall Laboratories, Division of Hagan Chemicals & Controls, Inc., Hagan Building, Pittsburgh 30, Pa.

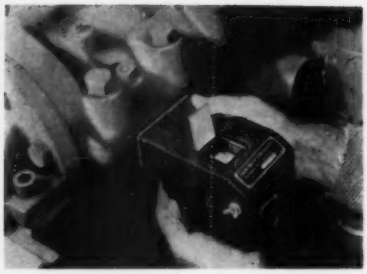
NEW PRODUCTS

(Begins on page 172)

the second takes over, says manufacturer, and such a setup can include any number of tanks. This selector valve has a pressure range to 100 psi. It has only three parts and is said to be unaffected by temperature, to be fast casting and to create no pressure drop or flow restriction. It is designed to handle any fluid that can be pumped, or any gas, can be had in many sizes and metals. New Products Corp.

64—HAND VIBROGRAPH makes vibration record

The Davey Hand Vibrograph is a compact self-contained instrument for making permanent records of machinery vibration on a continuous paper chart. It measures amplitude and frequency. According to company, wave forms are shown in the minutest detail. A salient feature is an instantaneous external adjustment which selects degree of magnification desired, giving 40, 20, 10 or 5:1 ratios. No battery or outside power source is required. A carbon shod ball bearing



probe is provided for taking measurements directly on the surface of rotating shafts. The Vibroscope Co.

65—HAND STRAPPING TOOL offers easier tensioning

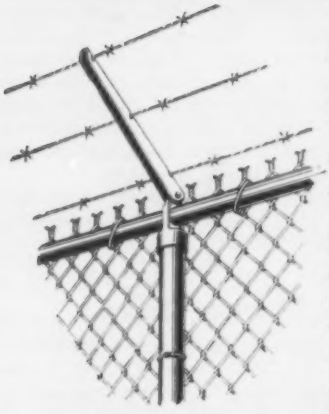
The lightweight B5 Stretcher is designed to provide faster, easier tensioning of steep strapping. This hand tool is balanced so that strap can be applied directly from any direction with the tool in any position. It is available in light, medium and heavy-duty models covering strap sizes from ¼ in. by 0.010 in. to ¾ in. by 0.035 in. A rotary gripping dog serves to give continuous take-up, making the tool effective for strapping compressible materials. The B5 Stretcher allows strap to be fed from a coil overhead, behind or in front of the operator, it is noted, and the seal can be applied in front of the tool or behind the rotary gripping dog to hold strap overlap to a minimum. Acme Steel Co.

66—STEEL BOX handles hot work in mill and plant

This high tensile steel "hot" box was designed to take the heavy abuse of handling hot work in mill and factory. The unit is made of Republic

50, a low alloy high tensile steel, and is intended for use in handling, stacking and storing hot work such as castings, forgings or special parts fresh from annealing. Made of 7-gage steel, the unit is 38 in. wide, 53 in. long, and 26 in. deep. Sides and bottom are corrugated; legs are squared on the bottom. Top of box has welded brackets into which legs fit when one

REALOCK
can solve your plant protection problems



If your plant needs positive protection against trespassers, vandals or others who might damage or destroy valuable property, Realock is your answer.

Because economical Realock Fence is custom-designed and erected, you get a fence that's specially tailored to your individual needs. Always made with heavy steel fabric, Realock is available in heights to 12′ . . . with or without special barbed wire tops . . . with either barbed or knuckled selvages. And—because it's produced at Buffalo, N. Y.; Pueblo, Colo.; and Oakland, Calif.—Realock's always quickly available.

Realock's a real long-term investment, too. It's heavily galvanized after weaving to guard against both rust and corrosion . . . then erected by skilled specialists to assure maximum fence life and service.

See for yourself how little it will cost to give your plant 'round-the-clock Realock protection. Contact our nearest sales office for complete details and free estimates—or write for Catalog F-915B.

THE COLORADO FUEL AND IRON CORPORATION—Denver and Oakland
WICKWIRE SPENCER STEEL DIVISION—Buffalo, New York

REALOCK FENCE
THE COLORADO FUEL AND IRON CORPORATION
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THIS 12" SAMPLE OF ALCOA ALUMINUM CONDUIT
ALCOA ALUMINUM CONDUIT
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SAFE, ECONOMICAL, EASIER-TO-INSTALL ALCOA ALUMINUM ELECTRICAL RIGID CONDUIT

To meet the growing demand for Alcoa® Aluminum Electrical Rigid Conduit, all sizes are being stocked in distributors' warehouses for fast shipment anywhere. Fitting manufacturers make a full aluminum line.

And why the demand?

Here are just a few of the reasons:

- Corrosion resistant . . . needs no maintenance painting.
- Two-thirds lighter than steel; saves work and freight.
- Easier to cut, bend, thread, install; factory-applied internal lubricant makes wire pulling easier.
- Large sizes cost less than steel; all sizes competitive when labor savings and other advantages are included.
- Nonsparking . . . Underwriters' Laboratories approved.
- Up to 20% less voltage drop.

Your local Alcoa sales office has all the facts on advantages of aluminum conduit and can provide technical advice. For additional information and a free sample, fill in and mail coupon below.

ALCOA ALUMINUM CONDUIT
ALUMINUM COMPANY OF AMERICA

Underwriters' Laboratories, Inc. INSPECTED
RIGID CONDUIT
ISSUE MC-36

Your Guide to the Best in Aluminum Value

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Company_____

Address_____

City and State_____

For more facts circle 631 on Reply Card

(Begins on page 172)

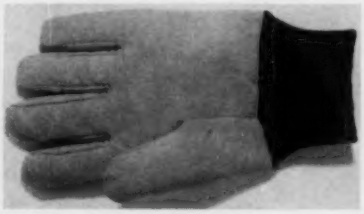
box is stacked upon another. Box stands 16 in. off ground to provide clearance for handling by fork lift trucks. Pressed Steel Div., Republic Steel Corp.

67—PLASTIC PANELS resist corrosive chemical fumes

Metal Grey Panels are a new type of structural plastic panel expected to last three times as long as standard corrugated metal panels in corrosive atmosphere. A formulation of polyester resin, Fiberglas-reinforced, these panels are a dull metallic grey in color and thoroughly opaque. A test installation reported concerns a fertilizer plant high concentrations of ammonia and sulfuric acid fumes necessitated replacement of the standard metal roofing and siding panels around every 2½ years. Metal Grey Panels installed there are claimed to be good as when installed after three years of use, and are expected to last at least five more years. Metal Grey Panels are slightly higher in cost than either metal panels or company's standard translucent panels. They are available in smooth finish in three standard corrugations in standard or extra heavy weight, also in a fire-resistant formulation. They are described as light in weight and easy to handle despite high structural strength. Resolite Corp.

68—GLOVES offer firm grip and long wear

The Mighty-Grip is described as a feather-light industrial glove that provides outstanding "safety grip" without sweating hands or tiring fingers. It is claimed to outlast and outgrip



other long-wearing gloves and to cost considerably less than others designed for the same work. The firm grip is attributed to tiny non-skid plastic dots —300 to the square inch—molded right into the cloth. Tests are reported to show that abrasive wear is absorbed by the dots, with little or no wear on the fabric. According to manufacturer, the glove is comfortable because the strong fabric is lightweight and flexible. And since this fabric "breathes" between the dots, it permits evaporation of perspiration. Industrial Glove Div., Riegel Textile Corp.

69—DRIVEWAY REFLECTORS light from all directions

This lightweight, economical marker which lights up from all directions is called the Spark-L-Ite. It consists of a hollow three-inch "beehive" molded

from transparent Plexiglas acrylic plastic with thousands of tiny facets in the inner surface. A row of these miniature "lighthouses" will mark a driveway around a 90-deg curve as if a string of electric lights had been turned on, company says, and they will pick up building lights or an automobile's back-up lights with equal facility. The molded domes have 36 flat reflective surfaces which reflect light from 12 directions and from any reasonable height above ground. Reflector Div., Dynamic Specialties Corp.

FIRST IN FILTRATION ADVANCEMENT

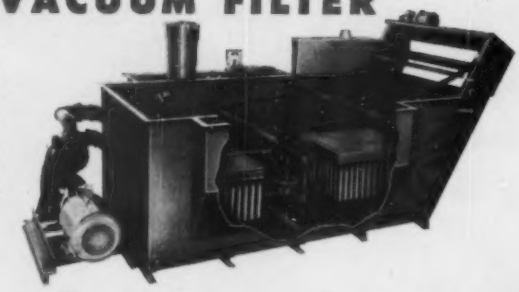
Delpark Announces . . .

THE

Dual Manifold Filter-Matic

VACUUM FILTER

For Constant, High Efficiency Filtration • 5 to 1000 G.P.M. Flow Capacities • 2 Different Filter Element Designs • 2 Forms of Permanent Filtering Media.



Smaller size with greater filtering capacity has been designed into the new Dual Manifold Filter-Matic. Through the Dual Manifold principle, the clean coolant reservoir, no longer a part of the filter, can be varied to meet the specific needs of the system. Constant filtration is achieved by opposite cycling of the dual manifolds. When one manifold is filtering the other is backwashing on the cleaning cycle. Absolute filtration is possible through precoating.

There's more to tell of the advantages through this newest filtration development for industry.

Write for more complete information.

Delpark

—First in Filtration Advancement

INDUSTRIAL FILTRATION COMPANY
165 INDUSTRIAL AVENUE
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WHEN YOU'RE IN A SQUEEZE FOR A PUMP

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B&G STOCK PUMPS

Why take a production loss because of a pump breakdown? B&G *maintains a factory stock of the most commonly used sizes of centrifugal pumps for immediate delivery!* Base-mounted and integral-motor pumps as listed in B&G Stock Pump Catalog are available in capacities to 325 GPM, heads to 140 ft.

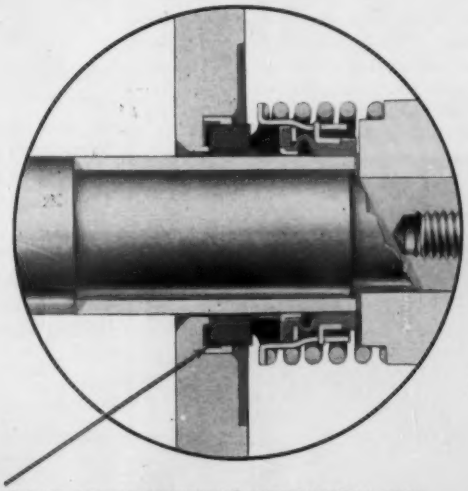
Your local distributor or B&G Representative will be glad to assist in selecting the proper pump for your needs. Or, write, wire or phone the Bell & Gossett factory at Morton Grove, Illinois. In any case, you'll get fast action.

B&G SERIES 1522, 1531 AND 1510 STOCK PUMPS ARE DISTINGUISHED BY VERTICAL SPLIT-CASE DESIGN...NON-OVERLOADING MOTORS...BRONZE FITTED CONSTRUCTION . . . LEAK-PROOF "REMITE" MECHANICAL SEAL

Why B&G Centrifugal Pumps give years of trouble-free performance is evident from their design features.

Vertical split-case construction permits removal of the bearing bracket without disconnecting pipe lines or motor leads. Solid cast iron volute—with support feet in larger sizes—prevents transmission of piping strains.

The shafts are made of special alloy steel, super-finished and oversized to keep deflection at a minimum. In Series 1522 and 1510 Pumps oil lubrication affords continuous protection to the heavy duty bearings. Leak-proof operation is assured by the "Remite"* Mechanical Seal—an exclusive B&G development.



***LEAK-PROOF "REMITE"® MECHANICAL SEAL**

This latest advance in B&G pump engineering features a floating seat of "Remite"...a new material developed after years of laboratory experimentation. "Remite" is so hard it will cut glass or steel—eliminates packing rings and gland adjustment. Seal is self-lubricating.

BELL & GOSSETT
COMPANY
Dept. FB-53, Morton Grove, Illinois

Canadian Licensee: S. A. Armstrong Ltd., 1400 O'Connor Drive Toronto 16, Ontario

BELL & GOSSETT CO., Dept. FB-53, Morton Grove, Ill.
Please send a copy of the B&G Stock Pump Catalog CSP-257A.

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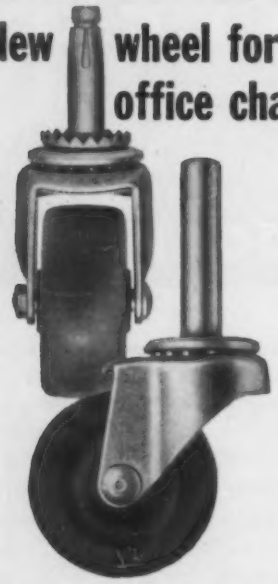
MATERIALS-HANDLING NEWS

NEW AND UNUSUAL APPLICATIONS OF BASSICK CASTERS THAT MIGHT BE ADAPTED TO YOUR HANDLING PROBLEMS

New wheel for office chairs



Sometimes a man will get so interested in plant efficiency he forgets office efficiency. Take a look around your place and see if new casters wouldn't help ease work, save floors and keep quiet. Along these lines, Bassick's 2" chair casters have a new wider rubber wheel that stands up 50% longer and gives you greater floor protection. Remember the office as well as the plant next time you need casters.

TV on casters

You've probably seen the receiving end of TV on Bassick casters many times, but here at WISH-TV in Indianapolis, they've also got the sending end of TV on our smooth-rolling, easy-swiveling casters. This TV dolly is one more fine product that's going places on Bassick casters. Look for Bassick as a sign of quality on all mobile equipment.

Oil company's shipping goes smoothly with shock absorbing casters

At Socony Mobile Oil Company's Paulsboro Refinery, big oil drums and cases of small cans of oil have to be moved from factory to warehouse to shipside.

Shock absorbing Bassick "Floating Hub" casters have helped to solve this materials-handling problem. Tractor-pulled trailer trains equipped with 10" single and double wheel "Floating Hubs" carry the drums and cartons to the ship-loading dock.

There are many advantages to equipping power-pulled trucks with these shock absorbing casters in any plant. They'll stand up to rough service over rough floors and roadways. They protect the loads carried, keep them stable and prevent parcels from falling off trains. They cut down on noise, they track well, and they hold maintenance to a minimum. Ask your distributor about Bassick "Floating Hub" casters.

New Bassick Gear Lock Clamp

Here's a revolutionary new clamp with a 2000-lb closure strength capable of providing an airtight seal in heavy duty containers. When locking nut (A) is tightened its worm gear mechanism turns gear (B) and closes clamp. This simple gear design provides an infinite number of closing positions, adjusts itself to varied tolerances, needs no special precision mounting. Saves labor in mounting, opening, closing.

Talk to your local distributor

Your Bassick distributor salesman can keep you up to date on new products and new ideas in materials-handling. Dealing with him also saves you time since you can fill many of your plant requirements from a single source. THE BASSICK COMPANY, Bridgeport 5, Conn. *In Canada:* Belleville, Ont. 7.43

see our catalog in Sweet's or write for copy

Bassick SYMBOL OF EXCELLENCE STEWART SW

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"Lighting Off" Explosions

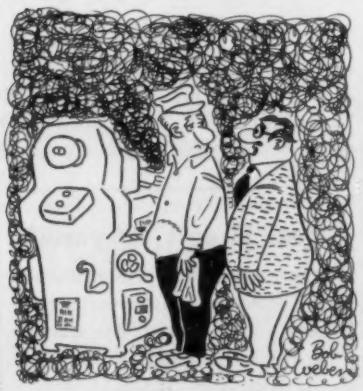
(Continued from page 143)

lighted simultaneously, pilots are necessary. Where fixed pilots are installed, they should be supplied with pre-mixed gas. Zero-governor-inspirator, high-pressure-atmospheric inspirator and gas-mixing-machine type mixers are preferable to low-pressure atmospheric inspirators. The pilot gas should be taken from the upstream side of the safety shut-off valve for the main burners.

A mandatory preventilation purge period, manual or automatic as practical, should be provided. Where possible, the use of limit switches which would require opening doors and fresh-air inlet dampers during the purge period should be employed. The generally accepted purge period is five minutes.

In all cases, a high-caliber, well-trained operator is the primary factor in safe lighting-off.

Electric FM Cock—A recent development is the electric FM cock, which consists basically of a conventional 2-way lubricated plug cock equipped with a special supervisory switch assembly arranged so the switch contacts are closed only when the cock is closed. (In sizes from ¾ in. to 6 in., the only Factory Mutual approved electric FM cock is the Fireye FM Supervisory cock available from Combustion Control Division, Electronics Corporation of America, Cambridge, Mass.) It is similar in application to the pneumatic FM cock and may be used with oil as well as gas burners. The pneumatic FM cock is suitable for use on gas burners only. **End**

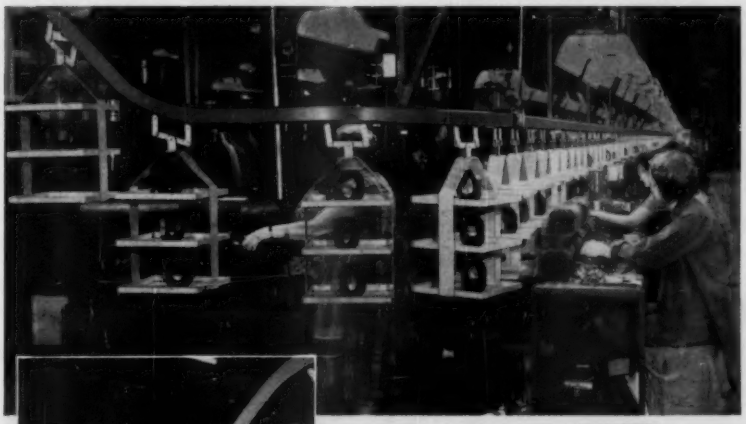


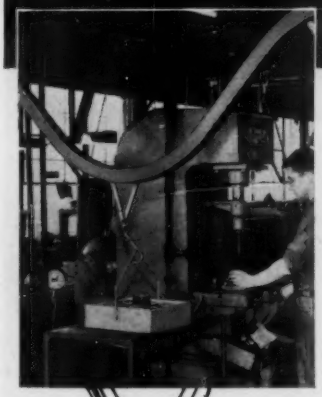
"Have you tried cutting oil, Benson?"

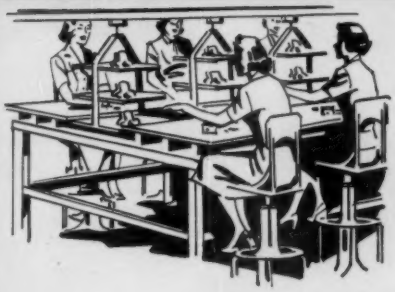
R-W "Zig-Zag"® CONTINUOUS POWER CONVEYORS

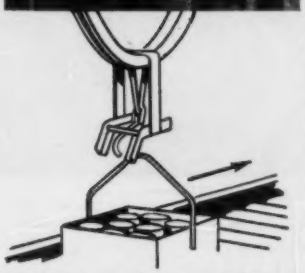
provide real AUTOMATION for

COST-SAVING OPERATION & INCREASED PRODUCTION









The above photo and line drawing demonstrate how the R-W "Zig-Zag" Conveyor *automatically* picks-up full trays *and automatically* deposits them at the unloading station. Machine operator starts cycle by merely sliding full trays into the conveyor path.

The above photos illustrate how various materials handling problems on the machining and assembly lines were effectively solved, for an electric motor manufacturer, with R-W "Zig-Zag" Conveyors. "Stuffing-Trays" carry a continuous supply of work to assemblers seated on both sides of a huge bench and just as easily carry the finished assemblies on to other operations in the plant. This "Zig-Zag" system utilizes available overhead space to increase production efficiency and provides for a saving of valuable floor space. R-W "Zig-Zag" Conveyors are flexible, easy to install, easy to alter or expand, economical to operate and offer longer, safer, more efficient materials handling service on any production line.

WRITE TODAY—
for complete information request Catalog No. A-93R.

Leading manufacturer of Track Hangers, all types of hardware and Electric Door Operators for over 75 years.

Richards-Wilcox MANUFACTURING COMPANY
Materials Handling Division

460 W. THIRD STREET, AURORA, ILLINOIS • Branches in Principal Cities

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Putting Color to Work

(Continued from page 127)

be selected so that the dado will provide a rest area for the worker's eyes when he looks up from his machine. Medium green is generally a good color as green has little if any effect on human emotions. Medium gray is also a good color.

h. Machines. The first consideration to be given when painting machines is workers' eye comfort. Avoid sharp contrasts on machines and dado.

Two-tone painting of machines is an accepted practice. Main body of machine is painted a neutral color and working area is highlighted with a lighter color.

I have used green with orange highlights against a light green dado, and dark gray with cream highlights against a green dado, but neither of these had any particularly good or bad effects that I know of.

j. Miscellaneous. Shop and office floors are generally painted a standard neutral color to provide for easy maintenance.

More decoration is possible in the plant where piping can be color coded, and lubrication coloroute symbols can decorate machines.

Many paint manufacturers have a complete industrial color systems package that you can have for the asking. Most are designed to compromise between the esthetic and the practical, which is what we mean by functional.

What incentive is there for the plant engineer to make him want to choose and use this new trend as a tool?

Rapid technological advances are being made in all areas. The plant engineer who wants to attain and maintain his rightful place in the ranks of top management, must keep pace with those in other fields.

Here then is *esthetics*, a new and useful tool with which you can increase your knowledge, and again demonstrate your usefulness to management by offering them more savings.

Savings may be obtained from elimination of hodge-podge by establishing color standards for your plant. This will drastically reduce your maintenance paint inventory. How many cans of assorted color paints do you think your maintenance is stocking now?

Savings that are intangible, such as increased production from improved employee morale.

Savings of the fees of outside consultants, architects, and colorists. Or if they are sometimes used in addition, your superiors will be pleased to know he has you to turn to for guidance in making his color decision.

A lot of successful plant engineers sold preventive maintenance programs which have savings to offer that are all intangible.

They will have an easy time selling color. It has savings to offer that are concrete. Even the intangibles here have interesting and easily believable selling points. **End**

Illustrated—New 9700 Series Piggy Back Hydraulic Control Valve Meets J.I.C. Standards

Look to Logan

the ultimate in hydraulic valve design

FREE SEND FOR THE "LOGAN CALCULATOR"

MEMBER: Natl. Mach. Tool Builders' Assn.; Natl. Fluid Power Assn.

LOGANSPORT MACHINE CO., INC.
838 CENTER AVENUE, LOGANSPORT, INDIANA

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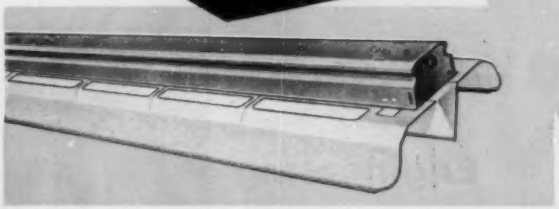
Tear Sheets, Anyone?

If you would like a copy of this or any other article appearing in this issue, just write to The Editor, PLANT ENGINEERING, 308 E. James St., Barrington, Illinois.

For more facts circle 636 on Reply Card

Light up with more UP-LIGHT from BENJAMIN UNITS

Benjamin 60" Apertured Top Reflector is one of Benjamin's expanded and re-styled 90/100-w line available from Graybar . . . provides 15% uplight. New molded plastic lampholders are mounted in steel housings for extra rigidity. Designed for two 60" T-17 bi-pin lamps.

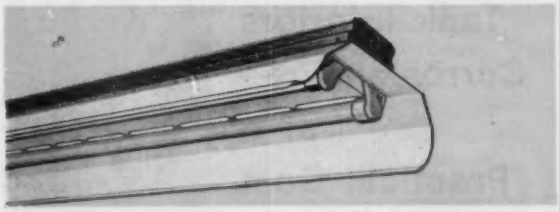


The new Benjamin RLM SD-1 Unit provides higher quality lighting due to 25% upward light, 27° shielding and special high reflectance porcelain enamel reflectors. Equipped with *Springlox* lampholders for easy-in easy-out lamp replacement and *Lok Latch* fasteners for simplified reflector removal. Available for 48" and 96" Slimline, 48" T-12 40-w Rapid Start, as well as T-12 800 ma. Rapid Start lamps.

More light towards the ceiling means greater seeing comfort below. This new trend in illumination helps you get greater economy in lighting and a better return on your investment in machinery, equipment and personnel. The Benjamin units shown on this page are typical of the modern lighting fixtures available from Graybar nationally.

Graybar also offers you the assistance of trained lighting experts to assist you in the study, planning, and recommendations of the lighting system best suited to your needs from the most complete selection of lighting equipment and G-E lamps available from any one source. Contact any Graybar location for prompt information and service. We invite your inquiry.

762-3212

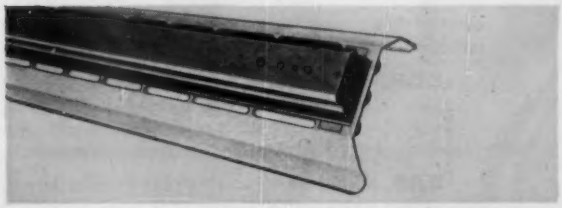


New Benjamin Units for higher light output lamps get 40% more light from the new 800 ma. fluorescent lamps. "Lifetime" porcelain enameled reflectors with ultra high reflectivity deliver the fullest measure of high efficiency. Individual units or continuous lines: open or closed-end; solid or apertured tops; for two or three 48" or 96" 800 mg. Rapid-Start lamps.

Send for these FREE booklets!

A Planning Guide to Improved Plant Lighting—A study of the economics of a Planned Lighting Program and the gains that may be made in terms of reduced production costs. Heavily illustrated.

Benjamin Industrial Fluorescent Lighting Bulletin—A 36-page bulletin thoroughly describing General Line and Protected Equipment, accessories and suspensions.



Benjamin Diffuser-Reflector delivers almost twice the upward light. Series of 14 apertures direct 10.7% of the light towards the ceiling. Helps relieve disturbing contrasts between upper and lower room areas, reduces eye fatigue.

CALL GRAYBAR FIRST FOR...

Everything Electrical
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IN OVER 130 PRINCIPAL CITIES

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Abrasive Belt Performance

(Continued from page 140)

ciency bogs down, ducts tend to clog, and if an oily lubricant is being used the oil-soaked dust piles up inside the ducts at sharp bends. Sparks from the grinding operation can start fires in these spots.

If the blower system becomes clogged, efficiency will fall off, and less and less dust will be pulled away from the vital point-of-contact area. This results in belt loading, and will produce wear on the idler pulley. Then, too, pieces ground on a grit 60 belt and moving on to a grit 80 or grit 100 belt, for example, may carry with them particles of the grit 60 which will cause wild scratches when the finer grit is applied.

Idler—In the idler mechanism, the effect of dirt will vary with the type of idler, but results are the same: unsatisfactory performance.

Every idler, no matter what the design, has adjustment screws which, when dirty, will contribute to hard operation and irregular tracking. Proper tracking, of course, is vital to efficient belt operation. A mis-aligned belt will wobble, producing edge wear which will result in an untimely end point. Tracking can also be affected by an idler which vibrates because of loose bolts or improper installation.

Tension is also an important factor. With fine grit belts and soft contact wheels, for instance, light tension is required. If the idler mechanism is dirty, more tension has to be applied to overcome the drag from the dirt—and the advantages of the fine belt and the soft wheel are minimized.

The idler should be positioned with each control set in the middle of its adjustable range. If an idler is set too far back from a given contact wheel, and the wheel becomes smaller through wear or a smaller size wheel is used, there may not be enough adjustment to take up the slack. Conversely, if the idler is set too close, and a larger wheel is employed, there may not be enough slack allowance to get a belt on the machine.

Speed Mechanism—When a lathe is converted to coated abrasive belts the speed is stepped up, since increased speed and faster grinding and finishing are important advantages of the coated abrasives system. A consideration here is that the horsepower of the machine also be increased. The formula is that if the speed is increased, the horsepower should be increased proportionately.

Variable speed drives tend to wear faster than fixed speed mechanism, so variable-type machines should be adjusted through their complete range of speeds every day. Most problems occur when a variable speed drive has been used almost continuously at one speed. This results in slippage and inefficient power transmission at that speed. The effect would be the same as if the machine was underpowered, even though the motor may be of adequate size.

Another place in which a dirty mechanism can lower abrasive efficiency is on platen-type surface grinders, or those with an automatic feeding device. Grinding pressures will vary if the work table sticks, leaving an uneven finish and promoting premature dulling of the abrasive belt. **End**

Engineering PLUS... Keeps Tank Interiors Corrosion Free at a Practical Cost

One of the five municipal tanks serving the City of Jacksonville, Fla. which has been cathodically protected by E.R.P. system since 1942.

The City of Jacksonville, Fla. has relied on engineering plus from Electro Rust-Proofing Corp. since 1942 to protect water storage tanks serving the city. Since installation of cathodic protection, tanks have been virtually corrosion free on the under water surfaces and maintenance costs have been reduced to a minimum.

E.R.P. engineering plus means cathodic protection systems
designed to meet your needs...
maintained to your benefit...
priced to your profit...

E.R.P. provides engineering plus to meet any corrosion problem of submerged or buried metals. For full information on cathodic protection for your water storage tanks, water treatment structures and pipelines, write for bulletin E-42.

ELECTRO RUST-PROOFING CORP.
A SUBSIDIARY OF WALLACE & TIERNAN INC.
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CABLE: ELECTRO, NEWARK, N. J.

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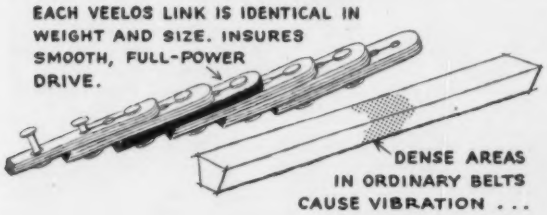
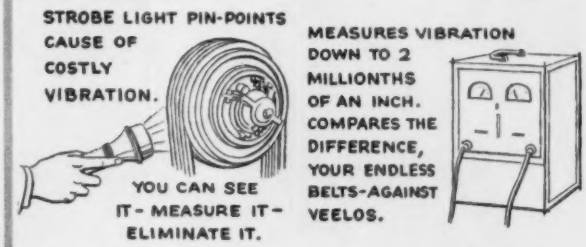
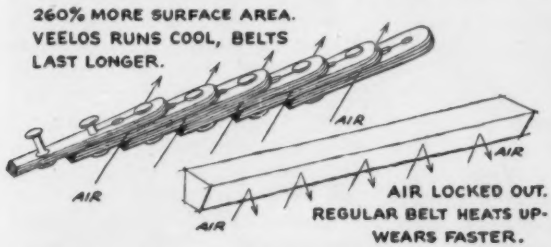
Six Reasons Why Veelos Adjustable V-Belts Are Better For Your Drives!


EACH VEELOS LINK IS IDENTICAL IN WEIGHT AND SIZE. INSURES SMOOTH, FULL-POWER DRIVE.
DENSE AREAS IN ORDINARY BELTS CAUSE VIBRATION . . . MACHINE WEAR

1. Balanced construction of Veelos Belts assures you faster, cleaner work, less rejects . . . less bearing wear. Each link and stud is identical in size and weight. Ordinary belts have varying spots of density which cause excess vibration—chatter marks, machine wear.


STROBE LIGHT PIN-POINTS CAUSE OF COSTLY VIBRATION.
YOU CAN SEE IT - MEASURE IT - ELIMINATE IT.
MEASURES VIBRATION DOWN TO 2 MILLIONTHS OF AN INCH. COMPARES THE DIFFERENCE, YOUR ENDLESS BELTS-AGAINST VEELOS.

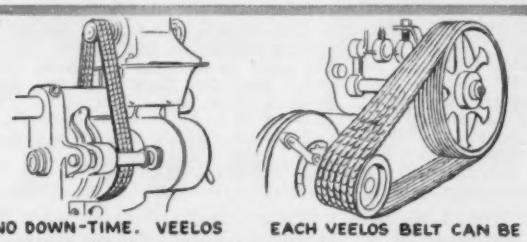
2. Electronic proof—up to 90% less vibration! With a vibration analyzer, you see, on your own machine, how Veelos belts decrease vibration up to 90% over any belt you're now using. This amazing Veelos test pin-points the belt that has the "invisible shakes."



3. Cooler running—long life! Veelos breathes! Constant circulation of air keeps Veelos running smooth. Regular V-belts have no chance to cool, heat builds up from the inside . . . causes slippage, wastes power, heats bearings, reduces belt life.

AREA CONTACT
POINT CONTACT
PERFECT VEELOS FIT. EXTRA THICKNESS AND MACHINE-CUT SIDES PREVENT BOTTOMING. MEAN CONSTANT POWER.
POWERLESS POINT CONTACT OF ORDINARY V-BELT. BULGES, SLIPS, CAUSES UNEVEN SHEAVE WEAR.

4. Greater flexibility reduces slippage! Sectional construction, beveled links allow greater flexibility, longer belt life. Each link moves around sheave independently and maintains full contact, constantly. Full area contact allows shorter centers, smaller sheaves.


NO DOWN-TIME. VEELOS FITS ANY DRIVE - WITHOUT DISMANTLING.
EACH VEELOS BELT CAN BE ADJUSTED - NO NEED FOR EXPENSIVE MATCHED SETS.

5. Simple installation "knocks out" down-time! Saves up to 50% installation time on outboard bearing drives, more when belt length isn't in stock. No resetting, tilting or moving motors. Veelos can be made any length, can be changed by adding or removing links.

6. Veelos won't stretch any more than ordinary endless V-belts when it is properly installed. *Remember—measure Veelos 1" short per foot and roll on drive as tightly as possible.* With the first few revolutions Veelos studs accept a permanent set into the sections they connect.

4 TYPES — FOR ALL DRIVES

REGULAR For general service
OILPROOF For oily and hot drives
COATED For wet or oily drives
STATIC-CONDUCTING For explosive atmosphere

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THE BALANCED LINK V-BELT
Known as Veelink outside U.S.A.

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MANHEIM
Manufacturing & Belting Co.
404 Stiegel St., Manheim, Pa.

"Industrial Belt Specialists Since 1911"

For all sizes and types of drives. Double-V available for serpentine drives.

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EXTREMULTUS belts always GUARANTEE LOWER BEARING LOADS

Belt speed capabilities over 10,000 feet per minute, narrower widths than any other belting, plus unequaled friction coefficient of EXTREMULTUS belts allow us to GUARANTEE bearing loads at a fraction of former values. The thin, elastic, incredibly strong polymer core of EXTREMULTUS soaks up shock without ever stretching, eliminates overtightening and delivers power without down time year after year. Write today for full information and descriptive catalog.

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NEW BOOKS

for the plant engineer

Fire Protection

APPROVED EQUIPMENT FOR INDUSTRIAL FIRE PROTECTION. 1957 edition; 184 pp; illustrated; paper bound. Published by Factory Mutual Engineering Division, 1151 Boston-Providence Tpk., Norwood, Mass. Price $3.00.

THE DEGREE OF INDUSTRIAL safety is highly dependent on equipment. Accordingly, protective devices, systems and controls and so on should have a quality of engineered dependability and the plant engineer should see that they do.

This guide presents material that is useful in the selection of safety equipment. It lists manufacturers of a variety of approved products and includes comments on different equipment and systems.

Among the items treated in this publication are the following: waterflow alarms; centrifugal fire pumps; foam and carbon dioxide extinguishing systems; electrical signaling systems and devices; fire extinguishers; combustion safeguards; and equipment for handling hazardous gases.

Transformers

MEDIUM SIZE TRANSFORMERS by Samuel Heller. Size 12¼ by 9½ in.; 208 pp including index; illustrated; paper bound (spiralled wire back). Published by Datarule Publishing Co., Box 69, Scarsdale, N. Y. Price $25.00.

TRANSFORMER designing, testing and reconnecting is treated in this informative book authored by a licensed professional engineer. The initial chapter of sixteen in this book is a general coverage of transformers dealing with types of cores and laminations, and the effects of frequency, efficiency, regulation and heating.

Separate sections carry information on single-phase, poly-phase transformers, and autotransformers. In the chapter on reconnecting and tapping such topics are discussed as testing for proper hookup, joining primaries and secondaries in parallel or series, and finding kva of tapped transformers.

In the back of the book there is a number of handy charts along with tables on various types of wire. In addition to this, a plastic ruler is included as an aid for picking off chart values.

Nuclear Reactors

U. S. RESEARCH REACTORS. Size 11 by 8½ in.; 73 pp; illustrated; paper bound. Available from the Office of Technical Services, U. S. Department of Commerce, Wash. 25, D. C. Price $1.50.

MORE THAN THIRTY research reactors now in operation or under construction are treated in this booklet, some of these at length. Features of others are illustrated and significant data is given for all.

Cost information is furnished for most of the research reactors, including analysis of the relation between the initial cost of the unit and total costs to make it useful.

Material on reactors in this publication is grouped according to major types. These are: light water moderated reactors (pool and tank categories); heavy water moderated reactors; graphite moderated reactors; homogeneous reactors; reactors for safety research.

In addition, this reactor booklet also contains a glossary of reactor terms and a listing of the United States research reactors.

On Job Improvement

WORK SIMPLIFICATION by Gerald Nadler. Size 9¼ by 6¼ in.; 292 pp including index; illustrated; cloth bound. Published by McGraw-Hill Book Company, Inc., 330 West 42nd St., New York 36, N. Y. Price $6.50.

TECHNIQUES OF WORK simplification and how they are used are explained in this book. Very little information is given about why the techniques work, or about the background and development of the concepts.

The book tells how to analyze and improve manual work methods to increase productivity, reduce fatigue, eliminate danger, and save materials.

Throughout the book emphasis is placed on the human being: operators, unions, management, and individuals included in each group.

Among the principal topics of discussion in this book are the following: operation chart; therblig chart; analyzing non-repetitive work; selecting the "best" method: reviewing and testing; and fundamentals of work measurement.

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WHEN YOU'RE PLAYING GOLF?

You shouldn't! Why not concentrate instead on breaking 90?

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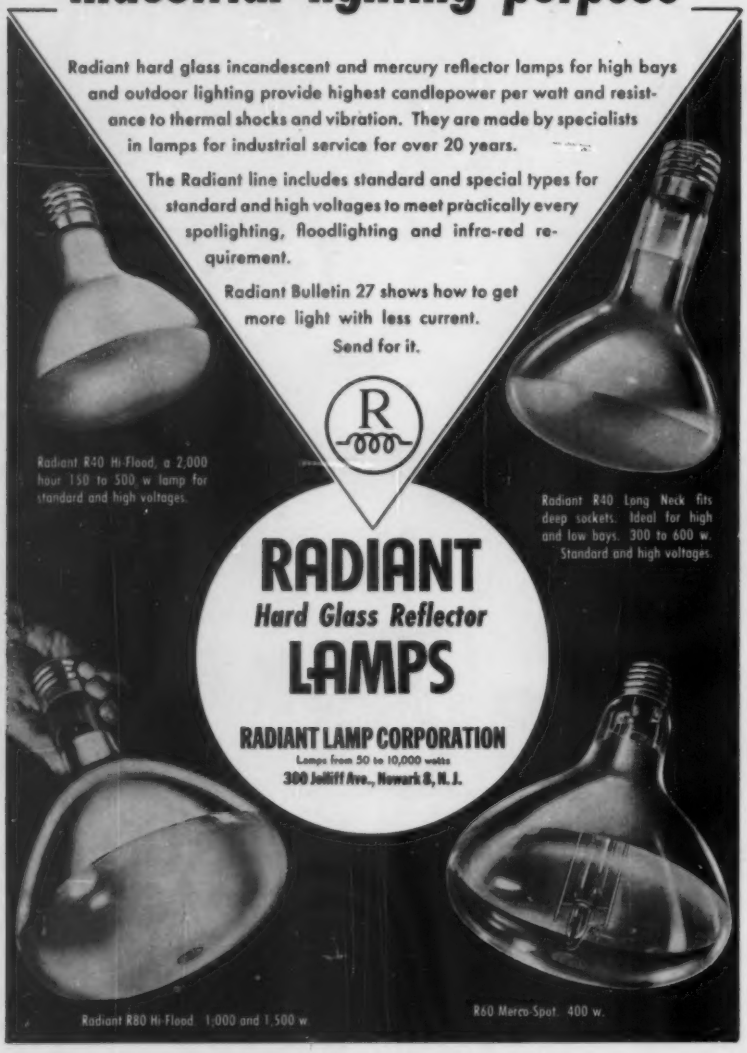
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New Plant Construction

(Continued from page 158)

sion program to increase company's production facilities here by at least 30 per cent. Company plans to increase present floor space of 450,000 sq ft to more than 550,000 sq ft. Preliminary work is already under way and plant will be in operation by mid-1958. Cost of plant and equipment reported to be in excess of $1 million.

Tulsa, Okla.—Sinclair Oil & Gas Co., wholly owned subsidiary of Sinclair Oil Corp., 600 Fifth Ave., New York, N. Y., plans to construct a new gas products plant at Lea County, New Mexico, for the processing of oilwell gas. The plant, a multi-million dollar project, will have a capacity of 10-million cu ft daily.

Ivy Rock, Pa.—Alan Wood Steel Co., Wood Road, Conshohocken, Pa., will construct a new powder mill adjacent to company's open hearth department, which will supply the new facility's hydrogen requirements from coke oven gas. National Cylinder Gas Co., has agreed to build an oxygen-producing plant nearby to supply oxygen for the powder operation. New plant with facilities will cost about $3.6 million.

Pittsburgh, Pa.—Harbison-Walker Refractories Co., Farmers Bank Building, plans to construct an integrated modern research center on a 21-acre plant site recently acquired by the company. Ground for the new facility has already been broken and, when completed late in 1958, will house all of the company's extensive research activities. Facility will represent investment in excess of $1 million.

Hopewell, Va.—Allied Chemical & Dye Corp., 40 Rector St., New York, N. Y., will double the capacity of its caprolactum plant here. Company has pioneered large scale manufacture of the product in this country using a special process first placed in operation in 1955. New expansion will increase capacity of plant here to 60 million lb annually, to meet the increased demand for the product.

Richmond, Va.—Reynolds Metals Co., Reynolds Metals Building, plans to construct a large research and office building here. Announcement followed a decision by the company to move its general sales offices from Louisville, Ky., to new location in Richmond, when completed. New facility will cost approximately $6 million.

Charleston, W. Va.—Westvaco Mineral Products Division of Food Machinery & Chemical Corp., San Jose, Calif., plans to construct a new plant for the production of dichlorocyanuric acid, trichlorocyanuric acid, and the sodium salt of dichlorocyanuric acid. Ground for the plant has already been broken and is scheduled for completion by the fall of this year.

How to tame a dust collection problem

Look for the 'hidden' factors that deliver important *extra efficiency*, like the exclusive Shave-off in Buell Cyclones that harnesses the double-eddy currents to trap an extra percentage of dust. Side-entry of gases, Buell-designed manifolds, proper proportioning, extra-heavy-plate construction provide even more efficiency. Send for the ready reference booklet, "The Collection and Recovery of Industrial Dusts". Dept. 14-L, Buell Engineering Company, Inc., 123 Wiliam Street, New York 38, New York

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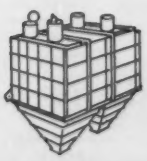

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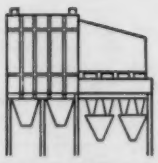

PRECIPITATOR-CYCLONE COMBINATION

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BULLETINS

(Begins on page 21)

145 Steel Flooring — Five different types of steel for floors, stairs, steps, ramps, catwalks, platforms and similar applications are described in 8-pp Bulletin 50-9. Includes tables of safe loads and other engineering data. Joseph T. Ryerson & Son, Inc.

MAINTENANCE

146 For Rust Removal—The properties and uses of the recently introduced powdered acid scale and rust remover are described in this service report. Advantages are discussed and recommended solution concentrations and application methods given. Oakite Products, Inc.

147 Paint Guide — This 12-pp paint bulletin features a comprehensive specification chart for all interior surfaces, including wood siding, trim, shutters, shingles and doors; masonry walls; asbestos-cement shingles; concrete and wood floors, decks and chairs; metal siding and many others. General painting specifications are provided. National Chemical & Mfg. Co.

148 Acrylic Latex Paints—"Progress Report 4," 58 pp, gives detailed summaries and tables covering company's findings in an extensive "every-climate" test program on acrylic emulsion paints. Summaries, photos and extensive tables describe results obtained from 3,000 test exposures in various locations, as well as data from a variety of laboratory-controlled test buildings. Rohm & Haas Co.

149 For Maintenance, Sanitation — This 44-pp catalog contains information on sanitation and maintenance products for industrial and other buildings. Products are placed in separate division for easy selection, with descriptive copy telling what product does, how it works, where it may be used to best advantage. Index lists floor maintenance products, soaps, germicides, insecticides, cleaning compounds, as well as soap dispensing equipment, floor machines. Huntington Laboratories, Inc.

INSTRUMENTS, CONTROLS

150 Liquid Meters — Bulletin OG-412, 8 pp, describes liquid meters for measuring liquid propane, liquid butane and liquid propane-butane mixtures. Also features an illustrated explanation of company's over-all dispensing system which insures liquid state of product throughout metering. Specifications and dimensions are tabulated and dimensional diagrams included. Meter and Valve Div., Rockwell Mfg. Co.

151 Liquid Level Gages—Condensed Catalog 305, 8 pp, illustrates and describes standard and special function gages and valves and gives dimensional drawings, construction features, pressure-temperature graphs and ratings, materials, and tables of sizes, specifications. Jerguson Gage & Valve Co.

152 Dial Thermometers—Bulletins 148, 149 and 150a describe bi-metal dial thermometers with back connected, bottom connected and "every angle" design for installation anywhere. Among other information, they include details on features, dimensions, and general specifications, as well as photos and dimensional diagrams. Manning, Maxwell & Moore, Inc.

153 Compact Indicators—Bulletin MSP-121, 12 pp, presents a complete line of compact measuring instruments for draft, pressure, differential gas pressure and temperature. Includes installation data, clearance and cut-out dimensions. Hagan Corp.

154 Boiler Control System — Covering all types of fuel burning systems, this manual deals with fuel loss — smoke, soot, and fly ash expulsion — boiler capacity and maintenance—operating safety, etc. It includes a preliminary boiler operation survey which makes it possible to closely estimate preventable fuel loss. Fuel Reduction Engineers, Inc.

WATER CONDITIONING

156 Zeolite Softener — Features of company's zeolite water softeners which assure efficient, dependable and easy operation are described in Bulletin 28 B7107A. Explains how standard units can be easily adapted to meet individual requirements where applications involve elimination of costly maintenance due to scaling of boilers, pipes. Allis-Chalmers Mfg. Co.

157 For Water Distillation — Three types of water evaporators, including vapor compression apparatus, flash evaporator and centrifugal compression still, are illustrated and described in this 8-pp bulletin. Lists models and capacities, weight, space requirements and other data. Badger Mfg. Co.

HEATING

158 Unit Heaters—Care and maintenance of steam and hot water unit heaters are covered in illustrated Bulletin 12. Covers installation essentials and includes a discussion of system corrosion. Air Moving and Conditioning Association, Inc.

159 Steam Heating Coils — Bulletin B-1418, 8 pp, describes double-tube steam distributing coils designed to distribute steam over entire coil-face area when steam supply is modulated for temperature control. Gives physical data illustrated with an installation type drawing, as well as selection data, tables on final air temperature, temperature rise correction factors, air friction tables, piping tips. American Blower, Div. of American Standard.

160 Steam Atmosphere Heat Treating—Catalog TD2-620, 20 pp, describes effect of steam atmosphere heat treating on high speed tool steel, cast iron, powdered iron, structural steel, brasses and bronzes, aluminum, beryllium copper and molded rubber. A variety of parts are illustrated and benefits achieved with steam treating cited. Leeds & Northrup Co.

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161 Steam Heating Coils — Catalog 1715, 12 pp, describes advantages and applications of company's heavy duty steam heating coils. Includes selection data and suggested piping arrangement, as well as diagrams and general description. Sturtevant Div., Westinghouse Electric Corp.

MACHINING, WELDING

162 Tool Room Grinding—Form A-1482 is a 24-pp source book on tool room grinding of alloy, high-speed and die steels. It covers 22 areas in the field and includes illustrative pictures and charts. Among subjects treated are aluminum oxide abrasives, properties and uses, wheel shapes and markings, broaches, chasers, cutters, circular form tools and hobs, offhand grinding. The Carborundum Co.

163 Cut-Machining Unit—This 8-pp bulletin describes the two types of the Roll-A-Round cut machining units—one power operated. Shows their use in cutting thin wall steel, tube, cast iron water mains, rubber hose with steel core wires, Transite pipe, others. Wallace Supplies Mfg. Co.

164 Guide to Better Welds—Bulletin EW-201 pocket size, contains 60 pp of arc welding information. Gives data on metals and electrodes, essentials of proper welding procedures, fillet weld, types of joints, typical welding positions, welding symbols, standard steel shapes available for welding, causes of common welding troubles and what to do about them, definition of welding terms, weight of weld metal deposited. Also covers spark tests by grinding, electrode selection factors, types of electrodes. Hobart Bros. Co.

MATERIALS HANDLING

166 M-H Case Histories—A packaged presentation containing seven case studies of how various manufacturers solved production, storage and shipping problems with modern materials handling equipment is offered in this loose-leaf notebook. Included are producers of furniture, instruments, castings and chemicals, as well as rubber and paper products. All case histories are illustrated. Equipment described includes hand lift trucks, electric fork lifts and electric walkie trucks. Lewis-Shepard Products, Inc.

167 Pallet Transporter — Bulletin 1008-W provides specifications and drawings of a low lift pallet Transporter, a walkie-type electric-driven industrial truck in lifting capacities of 4000 and 6000 lb. A feature of the trucks is a set of spring-loaded pawls to hold pallet firmly while forks enter. Automatic Transportation Co.

168 Sling Chains — Properties and capabilities of company's registered sling chains are fully discussed in

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ADVERTISED PRODUCTS, SERVICES

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BULLETINS

(Begins on page 21)

Bulletin DH-101. Featured is a listing of the 7 points to consider when ordering sling chains, and a chart giving working load limits of 2-leg chains. American Chain Div., American Chain & Cable Co., Inc.

169 Liquid Handling Equipment—Catalog 65 is a 100-pp brochure covering loading arm assemblies, loading valves, swing joints, truck tank equipment, storage tank fittings and miscellaneous products for the efficient handling of bulk liquids. Contains full specifications, diagrammatic views and recommended applications on all standard products. Wheaton Brass Works.

LUBRICATION

170 Industrial Lubricants—This 16-pp booklet describes a wide range of tough lubrication jobs of industry and explains use of company's products in solving severe applications. Products are detailed as to type and application. Also shown and described are facilities and laboratories. The Brooks Oil Co.

171 Regulator-Filter-Lube—Bulletin 80, 12 pp, describes a packaged unit for compressed air operations, which regulates to desired pressure, filters water and dirt from the air line and lubricates the air stream with a fine fog-like oil mist. Specifications for the various types in the line are included, as well as photos, drawings and diagrams. Perfecting Service Co.

OTHER EQUIPMENT

172 Radiographic Materials — Described in this 16-pp booklet is company's line of industrial radiographic materials and accessories. Booklet contains a guide chart for selection of film for various material thicknesses. Recommended development techniques are also charted. Relative speed and recommended development of films for X-ray diffraction are also listed. X-ray Sales Div., Eastman Kodak Co.

173 Airfoil Fans—Catalog 1121, 12 pp, describes efficiency and quietness of airfoil blading for all-purpose applications in a standard line of centrifugal fans covering requirements up to 700,000 cfm and up to 16¾ in. total pressure. Selection charts are included, and block dimensions are detailed. Westinghouse Electric Corp.

174 Tips on Storage Racks—A new concept in storage rack construction from ordinary pipe is discussed in this 24-pp book, entitled, "Be Your Own Storage Rack Expert." Tells how to construct storage racks from pipe and a simple clamp. Tube-Strut Corp.

175 Stainless Fasteners—This 52-pp stainless fastener stock list and data book covers company's standard and special products. First part of the book includes illustrations, thread and design specifications, and availability in a variety of corrosion-resistant metals of 40 basic fastening devices (screws, bolts, nuts, washers, rivets). Second part consists of engineering data relating to the composition, properties, applications, and weights of stainless. Allmetal Screw Products Co., Inc.

176 Rotary Pumps—Bulletin 2064-B1 describes company's heavy duty rotary pumps designed for efficient and economical service. Includes cutaway views illustrating features, and gives dimensional data as well as typical speeds, capacities, pressure, and power needs. Worthington Corp.

177 Drawing Instruments—This 38-pp catalog illustrates and describes company's line of drawing instruments, drafting scales, stainless steel T-squares, stainless steel triangles, and stainless steel straightedges. In addition to descriptive and price information, gives directions covering the use and care of drawing instruments. Theo. Alteneder & Sons.

DATA FILE of literature for the plant engineer's library

STANDARD CATALOGS, bulletins and handbooks are listed to help plant engineers maintain a permanent data file. To get these free catalogs, circle item numbers of those wanted on postage-free cards provided for you on pages 237-238.

MAINTENANCE

301 Basic-Roofing Information—"What You Should Know About Your Roof" is a 40-pp clearly illustrated booklet which tells what makes a roof fail, how to recognize signs of roof deterioration, what to do to keep a roof in good condition. Discusses recommended roofing practices, essentials of good re-roofing job. Johns-Manville.

302 Roofing and Siding Data—This folder contains Bulletins 2032, 2032A, B, C and D on corrugated Asbestone roofing and siding, stud weld fasteners, staggered joint application and straight joint application. Includes specifications, as well as photos and dimensional drawings showing construction details. National Gypsum Co.

303 Protective Coatings—Corrosion control in the operating plant is the subject of this bulletin, which outlines several corrosion-resistant coatings systems for buildings and equipment, structural steel, towers and columns, tanks and piping. Properties and uses are given. Amercoat Corp.

304 Painting with Aluminum — This helpful booklet describes advantages of aluminum paints, describes three basic types for non-absorbent surfaces, for weather-exposed wood, and for heated surfaces and those not exposed to weather. Typical maintenance applications are covered in text and picture, and practical suggestions are given. Aluminum Company of America.

305 Vacuum Units — This bulletin describes heavy-duty, portable vacuum units designed for a variety of plant housekeeping jobs. Application in removing litter, conveying or reclaiming materials, and collecting hazardous matter is covered. Invincible Vacuum Cleaner Mfg. Co.

STORAGE EQUIPMENT

306 Storage Equipment — Catalog 100-F, 72 pp, illustrates and describes company's complete line of steel cabinets, folding chairs, work benches, tool stands, shelving, tool storage, lockers, coat racks, filing cabinets, revolving bins, others. Includes dimensions and specifications, installation photos. Lyon Metal Products, Inc.

307 Storage Racks, Bins—Many innovations in the Sturdi-Bilt adjustable storage rack and steel bulk bin lines are described in two bulletins offered by the company. Bulletin BB-956 covers steel bulk bins, with easy-to-follow charts for planning storage needs, and diagrams demonstrating construction principle for instantaneous readjustments. Bulletin SR-956, 8 pp, covers adjustable storage racks, with specifications. Sturdi-Bilt Engineering Co.

TOOLS, WELDING AND MACHINE SHOP EQUIPMENT

308 Portable Electric Tools — This standard catalog, Form 10, 24 pp, features portable electric tools, including electric drills, bench-drill stands, hole saws, buffing and polishing kits, sanders, polishers, grinders, hammers, saw blades, vacuum cleaners and others. The Black & Decker Mfg. Co.

309 Industrial Tools — Information on a complete line of industrial tools, including 500 new types and sizes never before offered, is presented in 120-pp Catalog 57. Included are complete lines of wrenches, socket wrenches, drop forged clamps, tool holders, set up and hold down tools, cutting tools and pipe tools. Photos, drawings and numerous charts and tables are designed to aid in tool selection. Armstrong Bros. Tool Co.

310 Data for the Shop—"Fluids and Facts for Metal Working" is a pocket-size booklet of about 44 pp. A section on metal working fluids covers their function and selection, preparation and use of soluble oils and paste compounds, and prevention of dermatitis. A section on metal working facts gives conversion tables, steel numbering systems, machinability ratings of metals. Standard Oil Co. (Ind.)

312 Where to Use Your Stud Driver —Twenty-pp pocket-size Form 955 describes and pictures applications of

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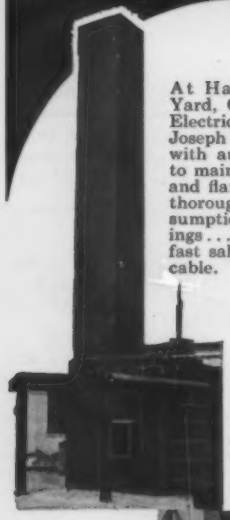

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DATA FILE

(Begins on page 239)

studs, using company's Model 450 stud driver. Provides some operating hints and safety precautions and covers use of studs through steel into concrete, wood into concrete, wood into steel and steel into steel, as well as their use for attachment of pre-drilled fixtures. Remington Arms Co., Inc.

313 Handy Fastening Tool — Two booklets show different ways in which this fastening tool can be used. One booklet shows how the tool can be used for plant maintenance—fastening conduits, bus ducts, junction and outlet boxes, surface raceways, fixtures and frames, duct straps, fan and blower mounts, sprinkler pipes, partition plates. The second booklet tells how it is used in lead lining. Ramset Div., Olin Mathieson Chemical Corp.

CONSTRUCTION

314 Aluminum Building Products — Form AD 285 is a 32-pp catalog covering company's line of aluminum industrial building products. Cites advantages of aluminum, pictures some installations. Installation data, weights, dimensions and roughing-in details are provided on corrugated roofing and siding, V-beam roofing and siding, ribbed siding sheet, perforated corrugated sheet, flat flashing sheet. Aluminum Co. of America.

315 Standardized Construction—This 28-pp illustrated catalog on company's system of standardization in building construction presents a description of "F" buildings, a versatile series of flat-roof structures. Luria Engineering Co.

316 Steel Buildings — Bulletin SX-11557 covers four types of buildings featuring Steelox panel method of construction. Condensed data are given, and drawings and photos illustrating design details included. Armco Drainage & Metal Products, Inc.

317 Partitions and Walls—Low cost sound-absorbing partitions and walls designed for movable and flexible office enclosures are featured in this illustrated bulletin. Dimensional diagrams and specifications are included, also installation photos. GR Products, Inc.

318 Steel Floor Plate — Skid resistance and other advantages of multigrip rolled steel floor plate are stressed in this illustrated bulletin. Also gives dimensions, weights, data on allowable loads. United States Steel Corp.

319 Non-Slip Flooring — Algrip, an abrasive rolled steel floor plate described as non-slip even on steep inclines, is the subject of Booklet AL-29, 8 pp. Discusses safety features; fabricating. Alan Wood Steel Co.

INSTRUMENTS, CONTROLS

321 Versatile Electronics—How flexibility of electronic temperature controls makes them useful in a wide range of heating and air conditioning installations is explained in this 16-pp booklet, Bulletin SA-2681. Purpose of publication is to fill the gap between the theory of electronic bridge circuits and specific control layouts and circuit diagrams. Four basic features that give flexibility are described. Minneapolis-Honeywell Regulator Co.

323 Contact Meter-Relays—Contact meter-relays, versatile instruments that both indicate and control almost any physical or chemical condition that can be detected electrically, are described in 40-pp Catalog 4-C. Supplies complete information for ordering and discusses various circuits for providing different types of control action. The catalog contains complete specifications. Assembly Products, Inc.

324 Stroboscope Data—Applications of the electronic stroboscope are illustrated and described in 8-pp Form 766-B. Includes complete descriptive and specification data on the Strobotac—a small, portable stroboscopic tachometer—as well as on the Strobolux, the Strobolume and the Microflash, used to produce single flashes enabling photos to be made of extremely fast action. General Radio Co.

325 Gages, Needle Valves—Catalog 76-G consists of a loose-leaf bound collection of literature on gages and needle valves. Various types of gages are illustrated and described, with applications and specifications fully detailed. A section on accessories is included, as well as one on specification, covering gage dimensions, dimensional diagrams, dial graduations, and other data. Jas. P. Marsh Corp.

326 Basic Controls—More than 34 basic types of industrial temperature and pressure controls are included in this 96-pp industrial catalog. Covers self-operating regulators, water mixing equipment, pneumatic control instruments, indicating and recording instruments, control valves and pneumatic motors. Equipment described is designed for industrial process control, as well as for heating, ventilating, and air conditioning systems, and hot water service. Powers Regulator Co.

327 For Limited Panel Space—Bulletin 532 describes Model 216 indicator used with company's automatic tank contents gage. Bulletin contains a full illustration of indicator which, although occupying a small space, has a scale 20 in. long. The Liquidometer Co.

LUBRICATION

329 Lubricating Greases — Bulletin 49 features two grades of greases developed for maximum lubrication under special bearing conditions—heavy loads, shock loads, and overloads. Uses, application methods, physical properties and benefits are detailed, and specifications are included. Sun Oil Co.

330 For Better Lubrication—Advantages of company's lubricants which are specially compounded for lubrication of reduction gear drives are outlined in pocket-sized folder. Features which assure smooth, trouble-free gear drive performance and lower maintenance costs are listed. Gulf Oil Corp.

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DATA FILE

(Begins on page 239)

331 Multi-Purpose Grease — This bulletin describes Gargoyle Grease BRB No. 1, intended to provide correct lubrication for practically all normally loaded anti-friction and plain bearings. Socony Mobil Oil Co., Inc.

332 Lubricant Data Book—Sixteen-pp Lubriplate Data Book No. 57-1, offers practical information on lubrication of machinery. Gives product data on grease type and fluid products, hydraulic oil, compressor oil, motor oil. Suggestions on applying lubricants under various conditions given. Lubriplate Div., Fiske Bros. Refining Co.

333 Oil Maintenance Equipment — Bulletin 172 offers pointers on diesel and gas engine lubricating and fuel oil maintenance. Includes general recommendations for lubricating oil filters, data on filter materials, and filters. Oil Purifier Div., The Hilliard Corp.

MECHANICAL POWER TRANSMISSION

335 Fluid Drive—Eight-pp Bulletin 9819 describes and illustrates adjustable speed Gyrol fluid drives, 1- through 25-hp, giving advantages and applications. Components and operation are covered in detail and selection tables given. American Blower Corp.

336 Helical Gear Drives—A new line of in-line helical gear drives is described in 16-pp Book 2651. Load classes for over 250 applications, overhung load ratings and dimension tables, instructions for proper selection and cut-aways included. Link-Belt Co.

337 Internally Geared Power—Featuring latest design improvements in gearmotors and embodying 60 multicolor illustrations, 16-pp Form F-1880 shows comparative advantages of gearmotors, lists ratings from ⅓ to 30 hp with gear ratios as high as 10:1. Cross-sectional details and enlargements of outstanding features are included. U. S. Electrical Motors Inc.

338 Magnetic Drives—Data on design, drive features, opening and performance curves, output torque rating-dimensions, selection chart, as well as photos of installations and applications are included in 6-pp Bulletin W-T 1-57. Whitney Chain Co.

339 Flexible Couplings—Condensed Engineering Catalog 51-A contains excellent data on the choice and use of company's flexible metal couplings for power transmission. Tells advantages of these couplings and discusses design principles. Double-flexing and floating shaft types, light duty couplings and types for special applications are detailed. Thomas Flexible Coupling Co.

340 V-Belt Economy — Disadvantages of makeshift and other ill-advised means of coping with stretched or broken V-belts are discussed briefly in this folder. Answers questions on V-belt maintenance, inventory, wear. The Manheim Mfg. & Belting Co.

341 What's In a V-Belt?—Informative little 16-pp Booklet S-51105 describes raw materials used in producing V-belts. Natural and synthetic rubbers, cotton and synthetic cords, rubber chemicals and steel cables used in company's line are subjects for explanations of each material's role in the final product. Goodyear Tire & Rubber Co.

342 Cylindrical Roller Bearings — Multi-Row cylindrical roll neck bearings are described in 24-pp Form 436. Contains complete engineering and technical data on cylindrical roller bearings designed for heavy-duty service in roll neck mountings on hot and cold rolling mills. SKF Industries, Inc.

343 Power Transmission Machinery —Bulletin A-646A, 8 pp, contains data on company's power transmission machinery, including sheaves, sprockets, bushings, conveyor pulleys, couplings, speed reducers, clutches, bearings, take-ups, V-belts, collars, and steel transmission pulleys. Also described is a dry fluid drive. Dodge Mfg. Corp.

344 Power Transmission Equipment —Form 1200, 12 pp, describes a full line of conservatively rated equipment for various power transmission requirements, including flexible couplings, variable speed pulleys, variable speed belts and sheaves, variable speed transmissions, motor bases, and universal joints. Dimensions and capacities given. Lovejoy Flexible Coupling Co.

VIBRATION CONTROL

346 Improved Machine Mounts — This brochure describes advantages of company's leveling machine mounts. Tells how they enable installation and leveling of heavy machines without bolting or shims, afford increased machine mobility, reduce maintenance costs, lessen noise. Barry Controls, Inc.

347 Vinyl Machinery Mount —Advantages of company's vinyl machinery mount are outlined in this illustrated brochure. Installations are shown. Clark, Cutler and McDermott Co.

PUMPS, COMPRESSORS

348 Continuous Flow Pump—Bulletin 30-C, 8 pp, outlines advantages of company's Moyno pumps which handle a variety of materials—from free-flowing liquids to non-pourable pastes, abrasives, solids. Describes principle of operation, discusses performance, construction, capacities, and includes specifications. Robbins & Myers, Inc.

349 Circulating Pump—Bulletin 1A-856 details seven advantages of companys' Booster circulating pumps, and includes complete design and performance data. Capacity chart and specifications included. Bell & Gossett Co.

350 Condensation Pumps—Eight-pp Bulletin 1403 describes company's line of condensation pumps for use in low and medium pressure-heating systems and steam-process equipment. Photos, drawings and other technical data on capacities and dimensions pertaining to construction, application and installation are included. Dunham-Bush, Inc.

351 Pump Data — Application and capacity data on company's line of pumps, including centrifugal pumps, screw pumps, reciprocating pumps, and rotex pumps, are presented in this product bulletin. Photos of eacl. of the models, along with descriptive detail, are included. Warren Pumps, Inc.

352 Solids Handling—Bulletin 121-A, 8 pp, describes non-clog pumps for handling solids in suspension. Included are vertical, horizontal and close-coupled types used to handle liquid components of industrial processes, industrial waste, and for such pumping applications as water supply, drainage and sewage handling. Specifications are included. Aurora Pump Div., The New York Air Brake Co.

353 Industrial Air Compressors — Twelve-pp Bulletin A-43 describes company's vertical design industrial air compressors supplying moderate amounts of air on a continuous 24-hr heavy-duty basis. Design features are described and illustrated by means of a cutaway view, and specifications and dimensions are tabulated. Joy Mfg. Co.

354 Air Cooled Compressors—Bulletin AC-15, 16 pp, shows a complete line of small, air-cooled compressors for industrial, and other use. Both one- and two-stage compressors are covered, with working pressures ranging from 85 to 175 psi. Complete specifications for each model are provided. Gardner-Denver Co.

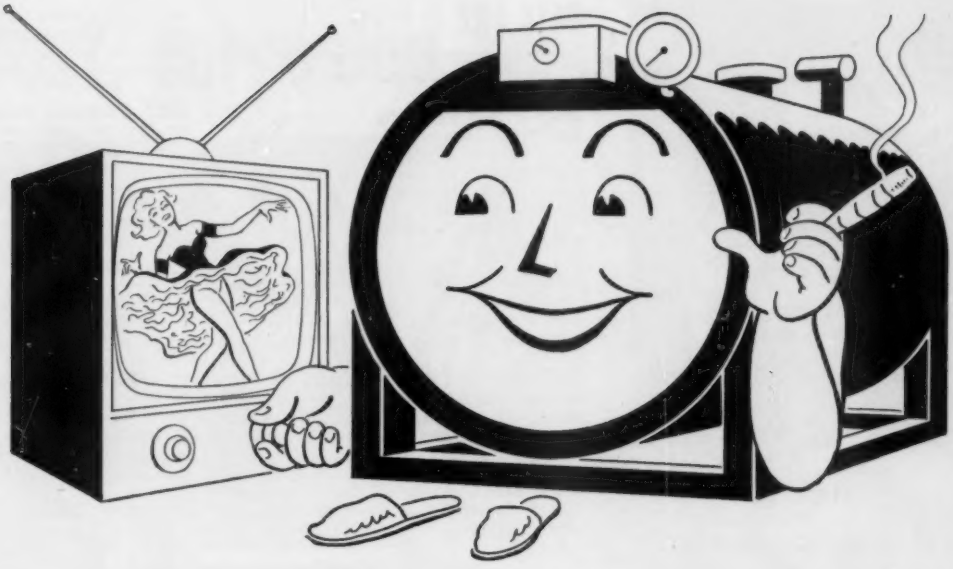
355 Portable Compressors—Twelve-pp Catalog GG-9A pictures 40 models of company's portable type compressors. A quick reference chart shows capacities, engine types, and mountings available. Illustrates such features as: replaceable cylinder sleeves, interchangeable valve parts, aircraft type compressor cylinders, heavy duty industrial type engines. Le Roi Div., Westinghouse Air Brake Co.

356 Industrial Compressors — Bulletin SSB-56 covers company's complete line of industrial air compressors from the ½ hp to 150 hp, including the accessories that go to make a complete installation. Photos of the various models are included, as well as specifications and dimensions. Schramm, Inc.

357 Turbo-Compressors — Bulletin 126-A, 12-pp, describes company's turbo-compressors which are designed to deliver constant pressure at all loads. Advantages are detailed, design and applications described, and pressure ratings of turbo-compressors shown. The Spencer Turbine Co.

PACKINGS, SEALS

358 Improved Packings — Advantages of company's Chevron packings for rams, plungers and reciprocating rods are illustrated and described in 8-pp Catalog AD-115. Tables show general recommendations for packings against various pressures, approximate depths. The Garlock Packing Co.



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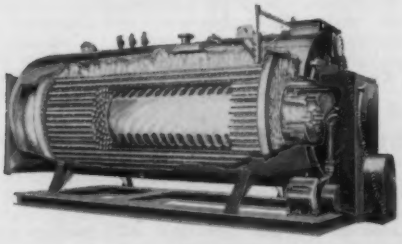

Cut-away view of typical Series A Continental Automatic Boiler, firing oil and/or gas. Other models from 20 to 500 hp, with on-off, low-high-low or modulating controls. For steam heating or process work at pressures from 15 to 250 pounds, or for hot water heating at low or high temperatures.

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DATA FILE

(Begins on page 239)

359 Piston Packing — Sixteen-pp Bulletin 5503 presents engineering data on Darcova Pumcups for packing pistons of air cylinders, hydraulic cylinders and reciprocating pumps. Included are operating diagrams and a list of typical installations, as well as helpful data on Pumcup compositions, textures and types made available for specified pressure, temperature and corrosive conditions. Proper compositions are identified for various gases, acids etc. Darling Valve & Mfg. Co.

360 Sealing Compounds—Twelve-pp Bulletin 7009 describes Titeseal, a group of sealing compounds, each designed for a specific purpose. Tells where Titeseal is used, how it is used, and how it acts to stop leaks and waste and prevent seizure of parts by rust and corrosion. Describes basic Titeseal blends. Radiator Specialty Co.

VENTILATING AND DUST CONTROL

361 Ventilation Units—Bulletin FM-315, 25 pp, describes basic construction of company's package propeller fans for commercial and industrial applications. Illustrated case histories of typical installations are included, as well as performance data rating tables, performance charts. Buffalo Forge Co.

362 Air Engineering Equipment — Bulletin 106 contains detailed information on company's line of air engineering equipment, including various types of air conditioners, fan heaters, spray coolers, concentrator, spray deck coolers, condenser, fan cooler, liquid cooler. Niagara Blower Co.

363 Hose, Retractable Duct—Eight-pp Bulletin 70 gives prices and complete information on company's hose and retractable duct. Photos illustrate applications and methods of cutting, bending and coupling. Selection data included. The Flexaust Co.

364 Industrial Dust Control—A wide variety of collection methods for industrial dust control is described in 16-pp Bulletin 922. A typical case history is included, as well as photos, cutaway views, drawings and capacity data on the various units. Pangborn Corp.

365 Electric Precipitators—The use of electric precipitators in the recovery of fine dust particles is described in 26-pp Bulletin 104. A cutaway view of company's electric precipitator showing component features is included. Advantages of the electric precipitation system are detailed, also installation procedure. Buell Engineering Co.

BOILERS, GENERATORS

366 Hot Water Boilers — Catalog HCC-2, 20 pp, describes and illustrates design, construction, advantages and economics of company's controlled circulation hot water boiler for supplying high pressure, high temperature water for heating systems and process applications. Comparison of heat content—water vs steam—is included on table. Combustion Engineering, Inc.

367 Package Boilers — This 12-pp booklet on package steam generators describes the formulas behind all package steam generators, and illustrates how installation of a package steam generator can raise steam capacity in an existing boiler room without extensive structural changes. Cyclotherm Div., National-U. S. Radiator Corp.

368 Automatic Boilers — Bulletin BE-4 describes operation and advantages of manufacturers automatic boiler's spinning gas technique—a method of obtaining maximum heat transfer with a simplified design. Shows cutaway view of boiler construction. Boiler Engineering & Supply Co., Inc.

Reader Service Cards for ordering catalogs are on pages 237-8. Be sure to include your name, job title, and company, even if you want catalogs mailed to your home address.

369 Self-Contained Boilers — Bulletin AD-162, 8 pp, describes company's complete line of self-contained boilers for heating and processing steam or hot water. Design features and advantages are detailed and a cutaway view showing flow of air in the forced draft system is included. Cleaver-Brooks Co.

370 Steam Generator Data—Bulletin C-731, 8 pp, contains detailed information on company's line of steam generators for all industries. Applications in both large and small plants are described, and performance and installation facts are furnished. The principle of controlled steam generation is explained by means of an operation diagram. Clayton Mfg. Co.

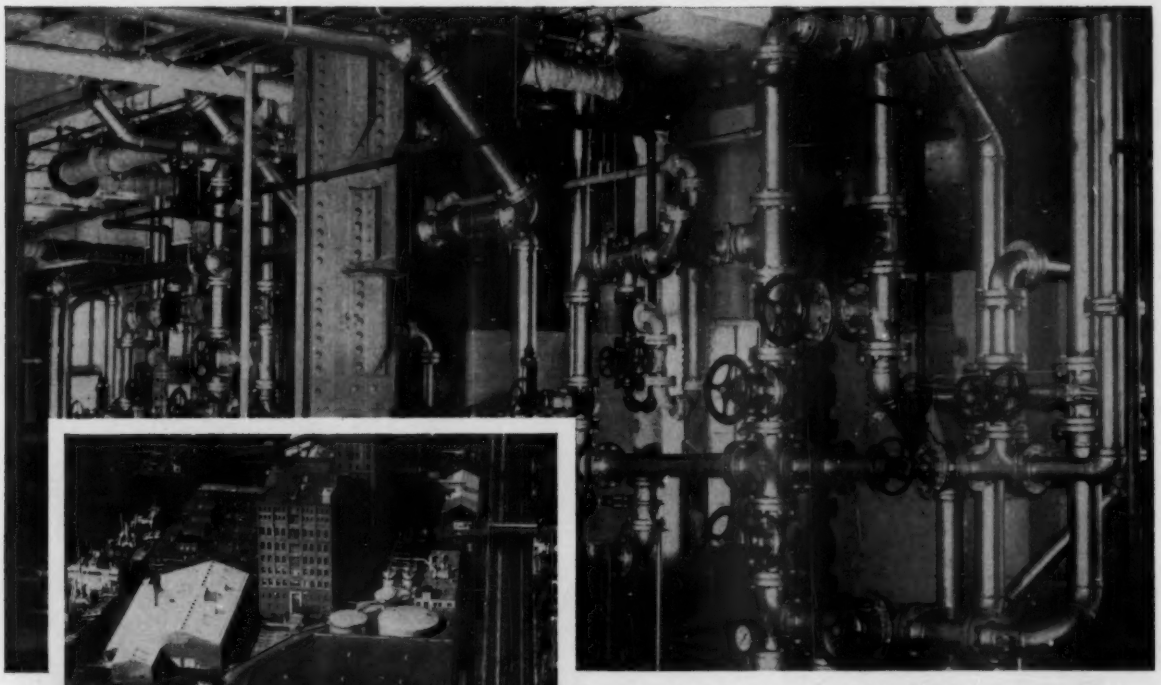
SPACE, PROCESS HEATING

371 Plumbing, Heating Supplies — Edition H is the current edition of this company's 126-pp general catalog on plumbing and heating repair parts, tools and accessories. Indexed and illustrated; gives sizes, intended uses. J. A. Sexauer Mfg. Co., Inc.

372 On Unit Heaters—Latest improvements, specifications and performance data for Herman Nelson horizontal and vertical unit heaters are covered in 36-pp Bulletin 700A. Includes complete hot water and steam performance tables, dimensions, selections, applications, descriptions of cabinets, elements, motor mountings, fans and accessories. American Air Filter Co., Inc.

373 Improved Space Heaters—Sixteen-pp Bulletin 564 introduces the Counterflo space heaters with induced draft Pyrojet burner designed to burn gas, light or heavy oil, or combination gas and light oil. Burner and other components are discussed. A large cutaway drawing shows construction and

Low cost, corrosion-resistant piping



The natural corrosion resistance of this welded piping system of Alcoa Aluminum insures long service life and prevents excessive maintenance for RS&S.

Aerial view shows section of Yonkers plant of Refined Syrups & Sugars, Inc. where a $5-million expansion and improvement program is now underway.

ALCOA Aluminum Pipe prevents product contamination for Refined Syrups & Sugars

Part of a continuing program of process improvement is the new ion-exchange system now producing highest purity Flo-Sweet liquid sugar for Refined Syrups & Sugars, Inc., Yonkers, N.Y. RS&S set this prime requirement for piping in the system: it must be highly resistant to corrosion . . . to prevent contamination of the syrup. They specified piping of ALCOA® Aluminum.

The natural corrosion resistance of aluminum insures high purity and low color level for the liquid sugar. Aluminum will not react chemically with the fluids in the process, and its low friction factor insures fast flow without high pumping costs . . . even with sluggish syrups. Furthermore, initial cost of aluminum pipe is far less than that of other corrosion resistant materials (e.g. schedule 40 aluminum pipe is about 1/7th the cost of schedule 40 stainless).

Like Refined Syrups & Sugars, you, too, will find that piping of ALCOA Aluminum is often the surest, most economical way to eliminate corrosion and prevent product contamination. Find out how you can put Alcoa Aluminum Pipe to work profitably in *your* process. Call the nearby ALCOA sales office listed in your classified directory . . . or mail the convenient coupon today!

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Please send me your FREE BOOKLET, *Alcoa Aluminum Pipe and Fittings.*

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are available in a complete range of sizes from fractional to 15 hp., ratios to 3 to 1.

Shown is a typical Lovejoy countershaft unit controlling speed of automatic spring coiler.

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can be supplied with hand wheel or lever control. Fractional to 5 hp., ratios to 10 to 1.

This Lovejoy Select-O-Speed is used to control the speed of a printing press.

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DATA FILE

(Begins on page 239)

operating features. Specifications and dimensions provided. Dravo Corp.

374 Unit Heaters—Catalog 157, 32 pp, contains performance and application data on company's line of unit heaters, including design and construction details, dimension diagrams, and tabulated information on steam capacities, conversion factors, hot water capacities, performance factors, and heat transfer coefficients. Piping and installation are illustrated. Modine Mfg. Co.

375 Unit Heaters—Bulletin FAS-1, 24 pp, describes horizontal and vertical discharge unit heaters for replacing process exhausted air with warmed fresh air and for comfort ventilation. Dimensions, capacities and suggested methods of installation are given, and photos, drawings and diagrams are included. L. J. Wing Mfg. Co.

376 Electric Heating Units—Catalog 50, 50 pp, contains complete engineering data on electrical heating units and equipment, including strip elements, finstrip elements, tabular elements, cartridge elements, ring elements, immersion heaters, circulation heaters, radiant heaters, forced air duct heaters, unit heaters, hot plates and others. Includes photos, dimensional drawings, prices, standard rating tables, and specifications. Edwin L. Wiegand Co.

WATER TREATMENT

377 Feedwater Treatment—Process Bulletin B1, "Treatment of Boiled Feedwater by the Direct, or Indirect Method," discusses advantages of direct treatment, as a complete treating program or as a supplement to external systems. Explains why direct treatment is convenient, economical, and complete. National Aluminate Corp.

378 Chemical Control and Testing—The need for intelligent chemical control and testing to assure the success of a water conditioning program is described in this 6-pp pocket-sized folder. Emphasizes need for explicit control limits and chemical tests to show that these limits are being met. Hall Laboratories, Inc.

ELECTRICAL

380 Totally-Enclosed Motors—Bulletin 500-A describes company's totally-enclosed, fan-cooled motors in ratings from ½ to 40 hp. Ratings and dimensions listed. Robbins & Myers, Inc.

381 Motors and Transformers—This 8-pp bulletin contains detailed information on company's electric motors and dry-type transformers. Rating and dimension data are presented in convenient tabulated form, and all illustrative detail, including photos and mounting diagrams is included. Wagner Electric Corp.

382 Enclosed Switches—Catalog 83, 28 pp, and Catalog 101, 20 pp, describe

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RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.

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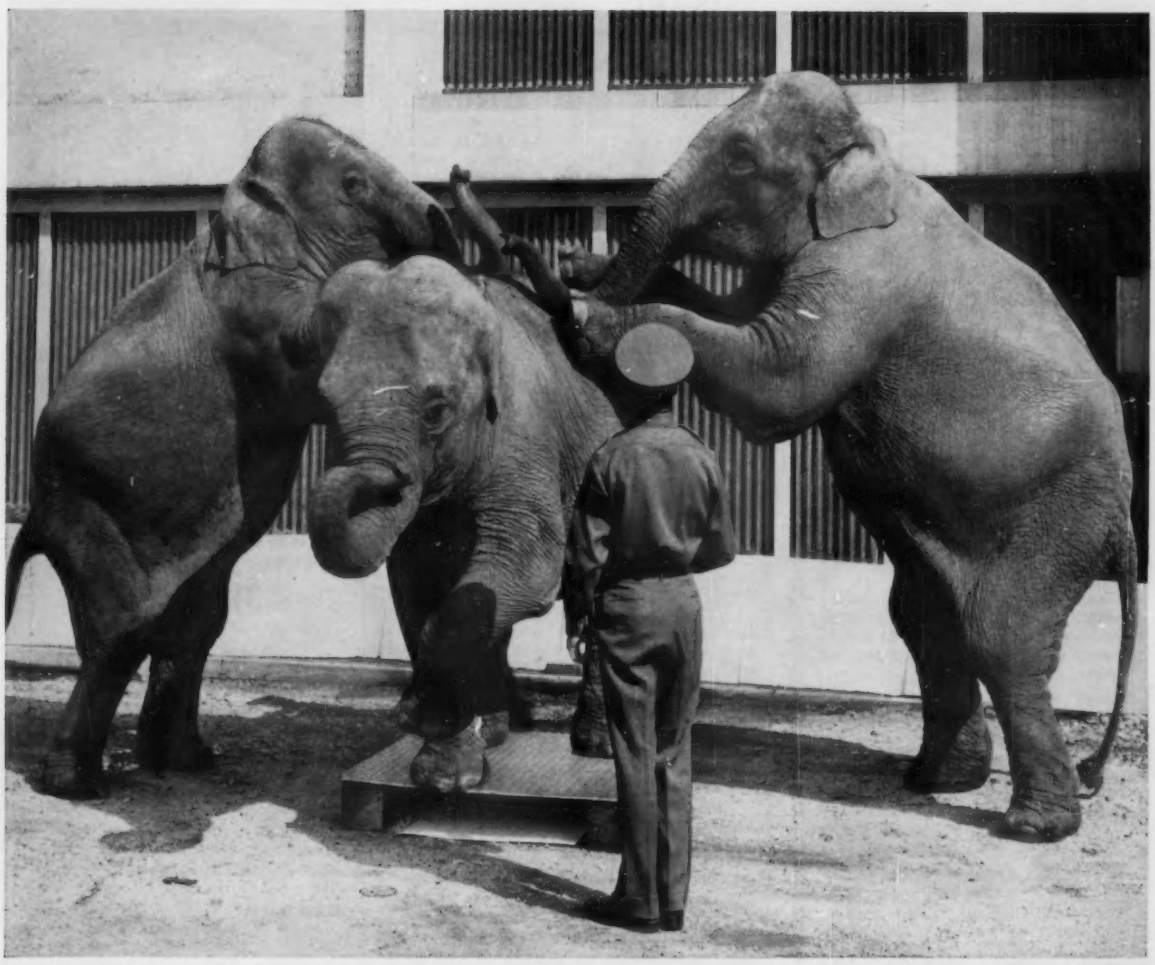

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34 years of research uncovers new solution

—Now, NEW (Patented) 'Sexauer' SELF- —LOCK Monel screws, with an imbedded —expanding NYLON PLUG, lock at the re- —quired depth AUTOMATICALLY—hold —washers FIRMLY!

—Made of rustproof, non-corroding —MONEL, heads don't twist off or screw —slots distort. They are easy to remove —when necessary, can be used over and —over.

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The hidden costs of faucet leaks!

Faucet leaks are costly! As authenticated by Hackensack, N. J. Water Co. and American Gas Association, STOPPING just ONE PIN-HOLE SIZE (1/32") LEAK can reduce water waste 8,000 gal. quarterly. If a HOT WATER FAUCET LEAK, water and fuel savings JUMP to over $7.58 QUARTERLY—plus additional savings on MATERIALS—LABOR—and *costly* FIXTURE REPLACEMENTS!

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DATA FILE

(Begins on page 239)

enclosed switches for industrial uses. Included are general switches designed for use on either a-c or d-c applications, sealed switches, heavy-duty limit switches, hand operated switches, and maintained-contact switches, all of which are available in a variety of actuator designs, contact arrangements. Micro Switch Div., Minneapolis-Honeywell Regulator Co.

383 Switch Wiring Diagrams—Bulletin 709 is a 36-pp booklet of typical wiring diagrams for across-the-line starting switches. Indexed and arranged for easy use, this booklet serves as a guide to some of the many ways in which this company's manual and magnetic across-the-line starters can be applied. Some of the diagrams incorporated more than one useful feature. Allen-Bradley Co.

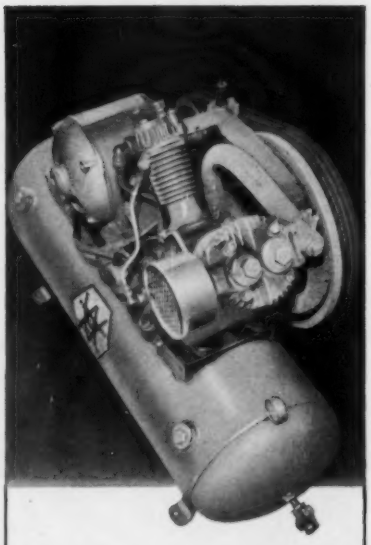
384 What You Should Know About Circuit Breakers—Sixteen-pp Manual 101 explains operating principles of basic circuit breaker designs and provides engineering data on factors of application. Includes simplified diagrams of three basic types. Illustrates with colored charts and diagrams, explains temperature factors, in-rush current effects. Heinemann Electric Co.

385 Secondary Unit Substations—Bulletin 9004-A, 20 pp, describes lower cost, complete flexibility and space saving of secondary unit substations. Photos and charts of construction are provided, also standard KVA ratings covering all types of indoor and outdoor substations. I-T-E Circuit Breaker Co.

386 Electrical Equipment Digest—Electrical equipment illustrated and described in 138-pp Catalog Digest 139, includes load centers, circuit breakers, low voltage control, fusible service equipment, interchangeable hubs, meter equipment and accessories, meter sockets and troughs, safety switches, panelboards, duct and fittings, starters, magnetic breaks, relays, contractors other equipment. Square D Co.

387 Trolley Busway Systems—Three bulletins offer real help on electrical installations involving cranes and hoists, assembly and production lines, moving test lines and other moving electrical equipment. Bulletin 35 (28 pp) covers 225-500 amp systems; Bulletin 50 (44 pp) 100 amp systems; Bulletin 45 (40 pp) 60 amp systems. Each includes special sections on installation planning and procedure, methods of mounting. Feedrail Corp.

388 Conductor Systems—This 36-pp catalog describes the Insul-8-Bar systems of mobile safety electrification for cranes, monorails and moving machinery. Includes photos and descriptions of typical installations, engineering data, installation procedure, a photo-text list of all catalog items that comprise these enclosed conductor systems. Catalog also explains how low cost safety is made possible by their simplicity. Insul-8-Corp.



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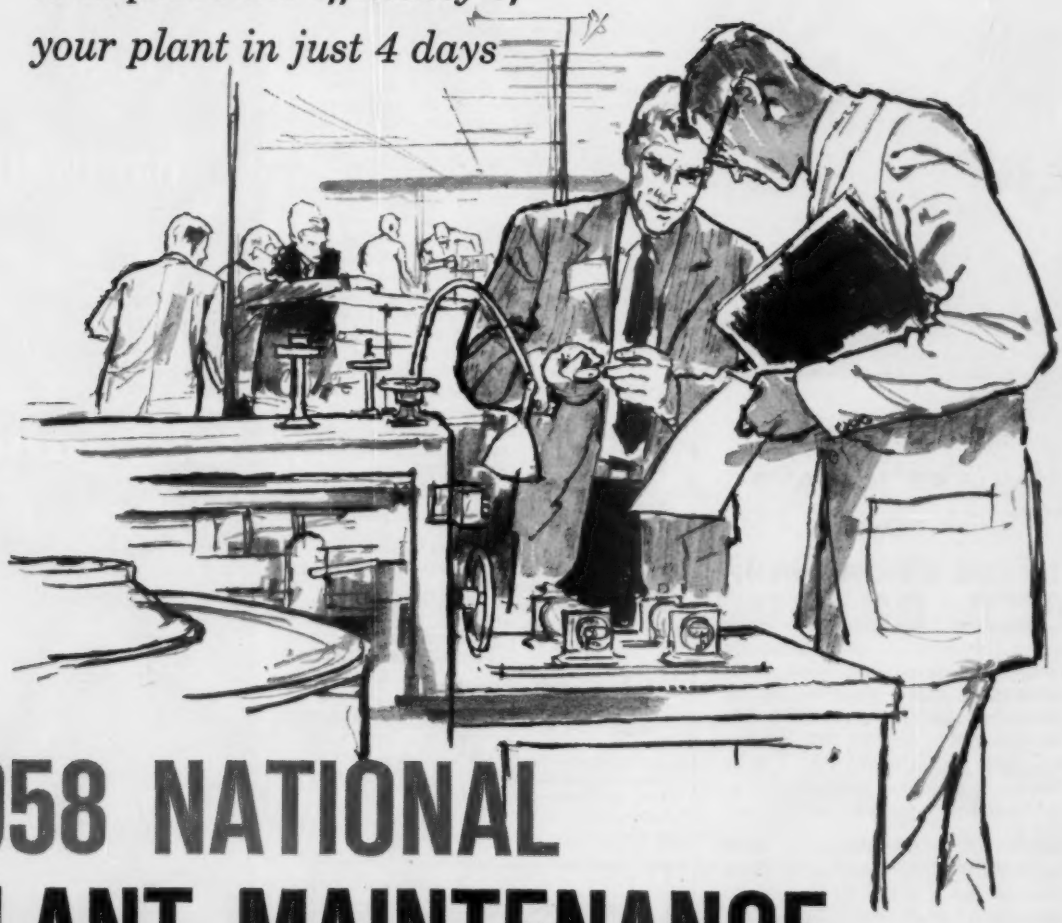

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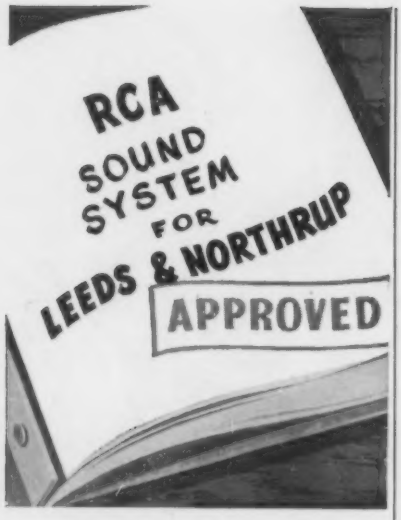

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Leeds & Northrup—a leader in measuring instruments and automatic controls—surveyed their sound system needs while a new plant was in the planning stage. They chose RCA, and the system that resulted performs five functions. Background music . . . code paging . . . electronic siren alarms . . . public address . . . clock signals.

One circuit carries all five of these functions, saving wiring costs. Each function has a priority rating, voice messages in emergencies topping the list. Noise in the plant ranges from normal residential levels to 120 db., but allowance for variations was simple with RCA speakers and amplifiers. Explosion-proof speakers help keep lacquer and paint-spraying areas safe. Girder-mounted amplifiers save valuable floor space, keep servicing easy.

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DATA FILE

(Begins on page 239)

389 For Motive Power — Catalog Form 5161, 12 pp, describes advantages and illustrates component features of company's Ironclad batteries, with Silvium, designed for motive power service. Describes design of the positive plate, as well as the negative plate, the microporous separator, and other features. Exide Industrial Div., The Electric Storage Battery Co.

390 Electrical Wires, Cable—Bulletin 1105, Section 1, 16 pp, features a cable selection chart and complete engineering information on company's line of electrical wire and cable. Advantages of the products are detailed, a table of insulations furnished, and design and construction features illustrated. The Okonite Co.

391 Time Delay Relay — Bulletin SD-1 features a selection chart for choosing the correct Agastat time delay relay for a variety of operations. Mountings and enclosures are also diagrammed. AGA Div., Elastic Stop Nut Corp. of America.

392 Cathodic Protection Cable—Two kinds of cathodic protection cables are described in this informative bulletin. Special advantages of each are listed, and applications and specifications are given. General Cable Corp.

393 Asbestos Insulation — "Specifications for Asbestos Varnished Cambric N.E.C. Type AVA Lighting Wire and Power Cables." 8 pp, establishes performance tests for asbestos insulation applied as a felted wall in combination with varnished cambric tapes for wires and cables with 600 and 1000 v ratings. Rockbestos Products Corp.

Postage-free Reader Service Cards make it easy to order catalogs. Cards are provided on pages 237 and 238.

394 Fuses for All Uses—This revised edition of manufacturer's complete line, Folder 3 includes illustrations and descriptions of fuses for every purpose. Features dual-element cartridge fuses for time-lag in protection against overloads, and delay renewable fuses and renewal links. Economy Fuse & Mfg. Co.

395 Oil-Tight Pushbuttons — Illustrated in full color, 30-pp Publication EL-178 presents company's line of oil tight pushbuttons, indicating lights, selector switches, Roto-Push buttons, covers and enclosures and accessories. All models are pictured along with selection charts, ordering information. Compactness, flexibility, durability, and neat appearance of the pushbuttons are discussed. Cutler-Hammer, Inc.

396 For High Voltage Cable—Test results and service records on an im-

Labor and time savings are a big feature of this CINCINNATI drum-type Cleaning Machine installed in the hardware division of a big-3 automobile manufacturer. Space-saving design washes both parts and media from previous tumbling and burnishing operations, then separates media automatically.

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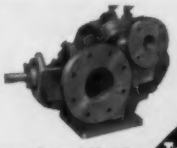

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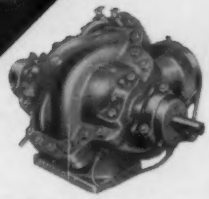

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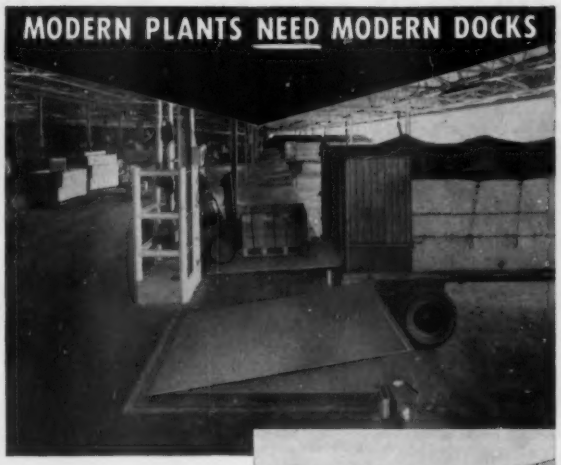
MODERN PLANTS NEED MODERN DOCKS



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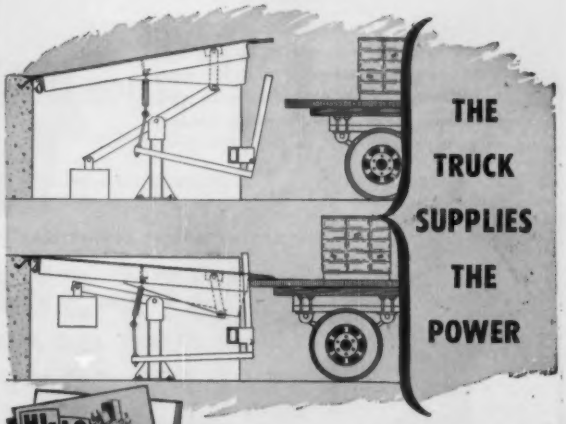

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DATA FILE

(Begins on page 239)

proved butyl rubber compound for high-voltage cables are announced in 12-pp Bulletin EB-27. Covers resistance to ozone, operating temperature, high-voltage, dielectric strength, aging, insulating resistance, mechanical moisture absorption, electrical moisture absorption, capacity and power factor. Anaconda Wire & Cable Co.

LIGHTING, COMMUNICATION

397 Architectural Floodlighting — Eight-pp Bulletin GEA-6437 illustrates various methods of floodlighting industrial plants, public and commercial buildings and others. Provides information on general purpose heavy-duty floodlights. Also contains tips on floodlighting of vertical surfaces. General Electric Co.

398 Outdoor Mercury Lighting — "How Mercury Vapor Outdoor Lighting Brings More Night Action." 8 pp, stresses low cost and versatility of mercury vapor lamps. Shows their uses in industrial areas, parking lots. Sylvania Electric Products, Inc.

399 Illumination Design Data—Basic reference data on interior lighting installations is contained in 48-pp Manual A-4854, which features a section describing footcandle levels required for each group of seeing tasks. These footcandle levels are then related to many kinds of rooms and areas. A chapter on interior lighting design describes ways of calculating quantity of light. Westinghouse Electric Corp.

400 Mercury Floodlighting—Bulletin 2696, 15 pp, describes color, floodlight beam, and operating charcateristics of mercury vapor lamps and discusses installations for which this type of lighting is best suited. Specifications, dimensions, and photometric data are included, as well as photos of typical installations. Coruse-Hinds Co.

401 Television Equipment—Twenty basic applications for "TV Eye" low-cost closed circuit television equipment are described and pictured in Form 3R2335. Folder explains equipment's functions and operation, lists specifications. Radio Corp. of America.

402 Lamps for Industry—Eight-pp Bulletin 66 presents manufacturer's line of lamps for industrial service, indoors and outdoors. These include mercury vapor lamps, weatherproof floodlights, high bay reflector lamps, spotlights, infra-red lamps, spatter-proof lamps, and others. Illustrated with photos, curves indicating candlepower, brief text covers features and applications. Radiant Lamp Corp.

403 Signal Equipment—Tips on how to select suitable signals for any specific operations are offered in one of a series of bulletins—Nos. 100-125—bound in this 40-pp catalog. Other bulletins describe horns, bells, warning lights, other signal equipment. Specifications, photos, wiring diagrams, di-

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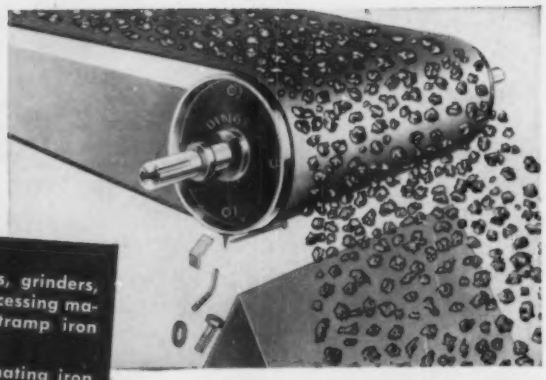

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DATA FILE

(Begins on page 239)

mensions, audibility rating charts, electrical characteristics and other data included. Federal Sign & Signal Corp.

MATERIAL HANDLING

404 Overhead Dispatch System — Form F 192, 8 pp, describes an automatic overhead dispatch system designed to solve a variety of materials handling problems. Outstanding advantages are listed and typical installations are described and illustrated with detailed diagrams. Component equipment utilized in this system is described. Richards-Wilcox Mfg. Co.

405 Steel Conveyor Belts—"A profitable approach to the selection of steel processing conveyor belts" is the subject of this 16-pp bulletin. Simplified selection, standard specifications, and installation information are included. Photos and diagrams illustrate the text. The Colorado Fuel and Iron Corp.

406 Cost-Cutting Materials Handling —"The How Book of Cost-Cutting Materials Handling," is a 24-pp booklet covering various phases of the materials handling problem and their effect on industrial production. Text and pictures cover such subjects as fundamental handling motions, advantages of planned material handling practices, analysis of handling organization, collecting handling data, diagramming travel. The Yale & Towne Mfg. Co.

407 Gantry Cranes—Bulletin G-203 describes design and operation of company's full and semi-gantry cranes, as well as special gantries. Capacity data and photos of typical installations are included. Chicago Tramrail Corp.

408 Electric Hoists—This illustrated brochure describes company's line of electric hoists designed for big-lift applications. A large cut-away view showing component features is included. R. G. LeTourneau, Inc.

409 Electric Hoists—Twelve-pp Bulletin DH 133B describes Speedway electric hoists of 500- to 4000-lb capacities. Fully illustrates and explains design features and gives details on suspensions and conducting systems. Clearance data included. Wright Hoist Div., American Chain & Cable Co., Inc.

410 Oil-Hydraulic Lifts — Catalog RE-203, 20-pp, covers the field of heavy-duty oil-hydraulic lifting devices for industrial applications. Featured in catalog are company's standard Levelator lifts, a 6000 lb single-jack model and a 12,000 lb dual-jack lift. Also featured is an electric pump mounted on an oil tank. Rotary Lift Co.

411 Electric Freight Elevator—Bulletin A-414, 12 pp, contains design and operation information on company's plunger electric freight elevator designed for low-rise, light and heavy duty freight handling requirements. A sectional diagram points out component parts, and an installation diagram and sizes included. Otis Elevator Co.

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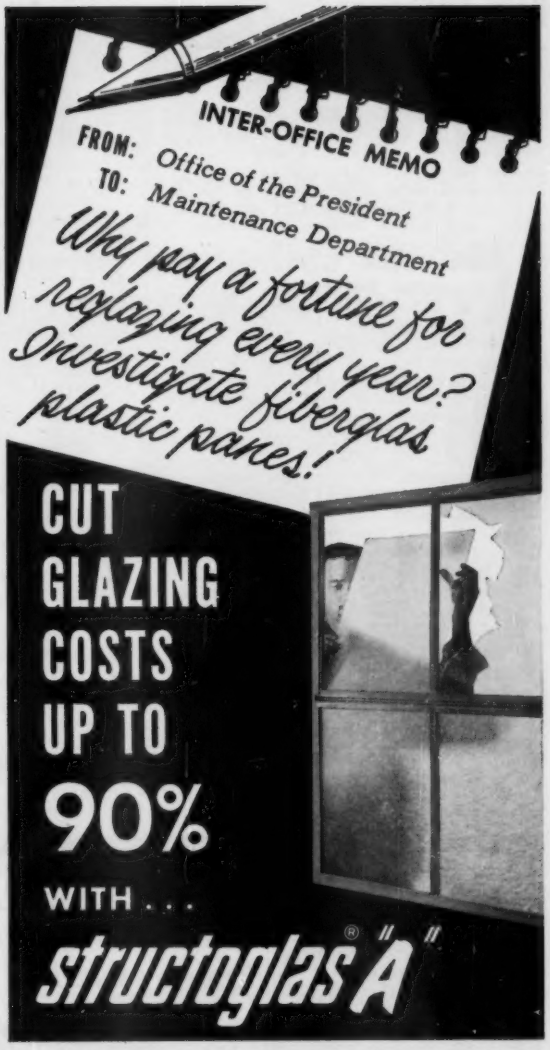
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DATA FILE

(Begins on page 239)

412 Sheet and Coil Lifters—Bulletin SL-30, 16 pp, illustrates and describes various types of standard and semi-special lifters for one-man or automatic handling of sheet and coil stock. Advantages and design features are detailed and tables listing dimensions included. Cullen-Friestedt Co.

413 Automatic Dockboards — Bulletin D-160 describes company's automatic dockboards for fast, safe mechanized materials handling. Features of the dockboards are illustrated and described, and general specifications included. Bulletin 181 covers specifications and layout for recessed models and package units. The Kelley Co., Inc.

414 Automatic Ramp—Power-operated, automatic-leveling dock ramps for either air-oil (air compressor) or electric operation are described in this 6-pp bulletin. Design and construction features are illustrated, and specifications are included. Globe Hoist Co.

415 Industrial Casters — Various types of casters for industrial applications are pictured and described in this large chart designed for wall mounting. Covers light duty, light-medium duty, medium duty, medium-heavy duty, heavy duty, extra heavy duty, trailer series, and special duty casters; gives selection data. Faultless Caster Corp.

FILTERING

417 Filters, Strainers—Industrial Catalog 1054, 48 pp, provides application and engineering information on company's line of micro-filters and precision strainers. Fuel filters, full flow and by-pass lube filters, air separators, and metal edge strainers for fuel lube and industrial use are also presented. Purolator Products, Inc.

418 Filter Guide—This 8-pp general bulletin illustrates six major filter types for industrial applications: disposable media gravity type, combination gravity and magnetic, straight magnetic vacuum, pressure and screen-type settling filters. Applications covered include all types of fluids from water to heavy viscosity oils. Descriptions of filter operation are given as well as applications. Industrial Filtration Co.

419 Data on Filters—Provided in this general catalog are product bulletins covering company's Staynew line of filters. These include intake filters, pipe line filters, liquid filters, hydraulic filters, automatic filters, dry panel filters, viscous panel filters, others. Catalog is available to qualified plant engineers. Dollinger Corp.

VALVES, TRAPS, PIPING

421 High Pressure Valves—Bulletin B-451, 12 pp, contains complete engineering data on company's valves for high pressure and high temperatures. Typical installations are pictured, dimensions and weights are tabulated, and temperature-pressure ratings are shown. Yarnall-Waring Co.

422 PVC Valves, Fittings—This 16-pp bulletin describes polyvinyl chloride valves and fittings offering resistance to most salts, alkalis and acids. Bulletin provides application tables on performance of normal impact PVC valves and fittings for handling 315 fluids. Cutaway drawing and text detail design features. Walworth Co.

423 Valve Performance Facts—Included in this 36-pp booklet are 32 case histories of cost-saving valve installations. Service applications covered include steam, oil, water, coating fluid, chlorine, phenol, pulp stock, vacuum, others. Industries include paper mills, refineries, central stations. Crane Co.

424 Corrosion Resistant Valves — Eight-pp Bulletin 8 provides engineering specifications and a discussion of the advantages of Aloyco 20 valves. Basic types and adaptable features of these corrosion resistant valves are presented. Includes data on corrosion tests on this metal with various concentrations of sulfuric acid. Alloy Steel Products Co.

425 Lubricated Plug Valves—Catalog PV-4, 36 pp, shows in detail a line of iron and steel lubricated plug valves. Many illustrations of single, screwed and bolted gland type valves are shown, including photos, sectional and detailed drawings. Also included is physical data on dimensions, ratings. The Wm. Powell Co.

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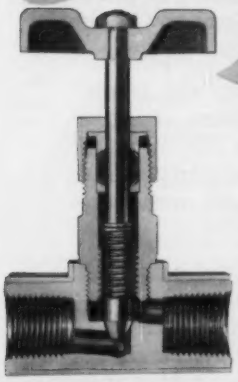

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DATA FILE

(Begins on page 239)

426 Plug-Type Valves — Long-life features of company's stainless steel plug-type valves are stressed in 6-pp Form 202-A. Cutaway view illustrates important design and operation features. Jenkins Bros.

428 Hydraulic Control Valves—Catalog 200-7, 16 pp, describes construction features and advantages of company's line of hydraulic control valves. Photos, dimensional diagrams, circuit wiring diagrams, and complete engineering data are included. Logansport Machine Co., Inc.

429 Valve Lubrication—This 19-by-24 in. chart contains maintenance and lubrication information for company's lubricated plug valves. Of heavy paper with metal edges, the chart features detailed exploded views of four types of valves and includes a table of recommended lubricants for oil, water, gas and chemical service. Meter and Valve Div., Rockwell Mfg. Co.

430 Steam, Air and Gasoline Traps—Catalog 751, 32 pp, is a trap ordering book with capacity tables, installation diagrams, and containing charts and formulas for determining proper size trap for specific applications. Covers thermostatic steam traps, expansion steam traps, weight-operating traps. W. H. Nicholson & Co.

432 Pipe for Modern Buildings—This 16-pp booklet discusses wrought iron pipe for modern buildings. Identifies wrought iron pipe and describes composition and advantages. Included are sections on wrought iron's resistance to corrosion and fatigue stresses, weldability, forming and threading, as well as the application of protective coatings. A. M. Byers Co.

433 Bellows Design Guide—Twenty-pp Catalog 155 contains helpful information on applications, design considerations, and standards for metallic bellows. Details on using bellows manufactured from various metals are included. Flexonics Corp.

OTHER EQUIPMENT

435 Industrial Finishing Equipment—Catalog A-657, 12 pp, describes a complete modern finishing system for cleaning, rust proofing, drying, painting and finish baking operations. The R. C. Mahon Co.

436 Metal Cleaning, Finishing—Principles of metal cleaning are discussed in this 24-pp illustrated catalog. A variety of metal cleaning and finishing machinery is described, including conveyor type cleaning machines, monorail type cleaning machines, drum type machines. The Cincinnati Cleaning & Finishing Machinery Co.

437 Boiler Tube Expanders—Bulletin Y-46, 16 pp, describes three general types of boiler tube expanders and includes detailed specifications to assist in selection. Along with the specification tables, the bulletin includes photos, drawings and diagram illustrating typical uses. Lagonda Div., Elliott Co.

438 Insulation Specifications—This set of six specifications covers application of Foamglas insulation for industrial equipment and piping. Each booklet contains tables of suggested thicknesses of insulation to be applied, drawings of installation procedure, supports, and recommended finishes. Booklets are devoted to low-, medium-, high-, and dual-temperature equipment and piping, to underground piping, and spheres. Pittsburgh Corning Corp.

439 Fighting Corrosion With Corrosion—Cathodic protection against rust and corrosion is the subject discussed in this illustrated 10-pp bulletin. Describes the corrosion battery, corrective measures, cathodic protection battery, and includes application data. Electro Rust-Proofing Corp.

441 Cream Deodorant Soap—How company's SBS-60 cream deodorant soap eliminates soap waste, reduces soap costs, cuts maintenance and offers other advantages is told in this illustrated bulletin. Answers to questions concerning its properties are included. Sugar Beet Products Co.

442 Abrasion, Corrosion Protection—This 24-pp book illustrates how company's rubber faced steel plate reduces maintenance cost resulting from abrasion or corrosion. Shows case histories covering use in a wide variety of industries. The Gates Rubber Co.

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DATA FILE

(Begins on page 239)

443 Padlocks—Catalog 56, 20 pp, features descriptions of padlocks to meet every need, with actual size illustrations of entire line. Special long shackle padlocks are included, as well as super security padlocks which have an extra short shackle clearance of only ½ in. Master Lock Co.

444 Steel Reservoirs, Standpipes—This 24-pp booklet pictures installation of reservoirs of 50,000- to 10,000,000-gal capacity, having cone, umbrella or ellipsoidal roofs and ornamental structures with special architectural features. Chicago Bridge & Iron Co.

445 Humidification For Profit—Sixteen-pp Bulletin 500 presents data showing how relative humidity affects hygroscopic materials, health and comfort, and formation of static electricity. Schematic diagrams and sectional drawings demonstrate operation of electrically and air operated steam humidifiers. Armstrong Machine Works.

446 Neoprene Design Book—This illustrated Bulletin discusses the properties of Neoprene, showing how they are utilized in products made from this chemical rubber. Covers its toughness, hardness range, air retention, performance under load, at extreme temperatures. Elastomers Div., E. I. du Pont de Nemours & Co.

447 Refrigeration Condensers—Engineering data on a complete range of sizes and types of refrigeration condensers are featured in 38-pp Bulletin RC-2. Ratings in tons refrigeration are tabulated for large and small ammonia condensers, vertical ammonia condensers, ammonia condensers-towers, freon condensers and freon condensers-towers. Selection data, dimensions, dimensional diagrams and tables of pipe sizes given. Henry Vogt Machine Co.

448 Heat Exchanger Tubing—Cited in this 30-pp catalog are typical cases where cupro-nickel or Monel tubing installed in heat exchangers resulted in substantial savings and better efficiency through longer tube life. Describes applications of this tubing in various instances where unusual water conditions, as to pollution, excessive turbulence, temperature and the like, required such tubing. The International Nickel Co., Inc.

449 Equipment Selector Charts—Bulletin CE-50, 20 pp, contains selector charts on corrosion-resistant equipment for process industries. Tables cover general considerations in selection of material, physical properties, corrosion resistance, techniques and skill in manufacture of equipment. Describes rubber and plastic pipe, tubing and fittings; valves; pumps; lined tanks. American Hard Rubber Co.

450 Incinerators—"The Incinerator Blue Book" is a 16-pp bulletin on incinerator developments, covering design features, methods of feeding and charging of refuse, waste analysis, and other information. An incinerator selection chart, classifications of incinerators, capacity and dimension data and specifications included. Joseph Goder, Inc.

451 Research Facilities—Twelve-pp Brochure 103-2M-956 describes research facilities available to industry on a contract basis. Services offered by this outside research staff in chemistry, chemical engineering, physics and mechanical engineering are explained, accompanied by case histories of recent research and development projects. Research Div., The Fluor Corp., Ltd.

452 Magnetic Selection Guide—Twelve-pp illustrated Catalog C-5000-B, describing manufacturer's entire line of magnetic separators and lifting magnets, serves as handy guide to selection. Dings Magnetic Separator Co.

453 Venting Fundamentals—Tank vents, fittings, and accessories for fire prevention and vapor control are described in this 34-pp illustrated bulletin, covering venting principles, operating fundamentals, fire protection, maintenance, non-conservation venting, conservation venting, storage tank filling, storage tank rodding and sampling, fuel tank filling. The Protectoseal Co.

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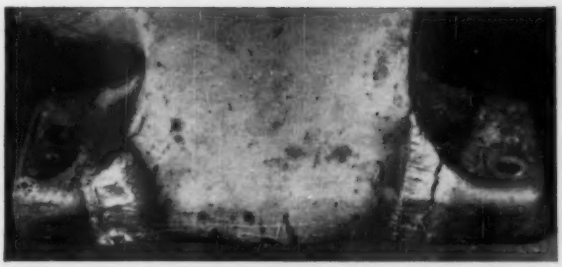

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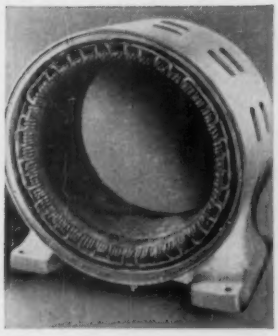

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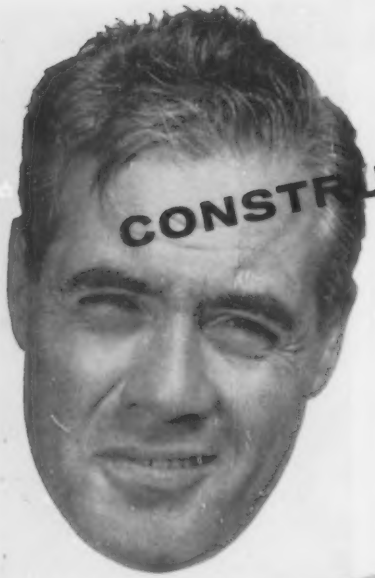

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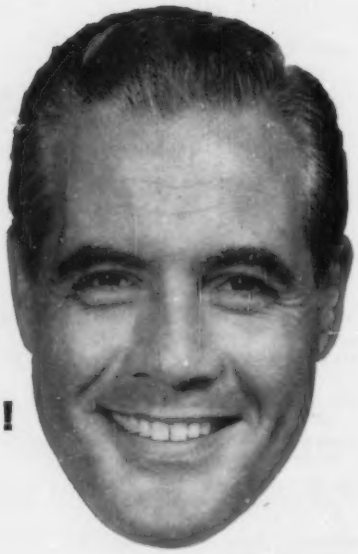

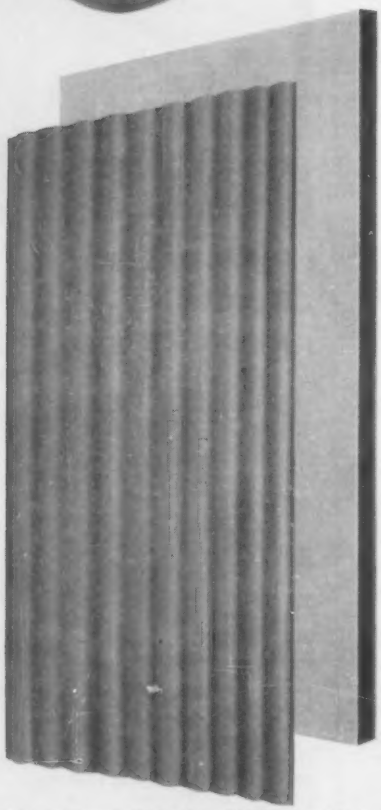

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